The Nature of Exploration in Database Art Practices

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Universidade do Porto
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THE NATURE OF EXPLORATION IN DATABASE ART PRACTICES

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To Joana

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My friends.

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Abstract

The collection, archiving and manipulation of data about ourselves and about the world is an age-old trait in human civilization that digital technologies came to exponentiate. The rise of the database as a repository of the dynamics of the world led artistic practices to explore it in their projects as source material and a conceptual medium. In a global analysis of practices concerning data and databases, exploration emerged as a key concept and fundamental approach in their processes. This particular notion led us to pursue an investigation on the nature of exploration in database art practices.

Our approach begins with the definition of a field of study whose artifacts appeared under a multitude of interchangeable categorizations such as *Information Art, Data Art, Data Visualization* or *Information Visualization*. The study proposes a grouping of these artifacts into a unifying category concerning the artistic exploration of the database, further refining it through the process of data collection, identifying it as Database Art Practices.

In order to analyze the collected data, the study establishes a set of a priori assumptions concerning a characterization of exploration. These were drawn from exploratory approaches to data from the fields of research in Science and Humanities, from exploratory database analysis in Statistics, from romantic notions relating to explorers and exploration, and finally resorted to Daniel Fallman's design exploration branch from his model on Interaction Design Research.

Through the analysis of the collected data against the pre-established set of exploration traits, the study was able to confirm and refine our assumptions into the definition of a core category system arising from the data. These allows us to formulate an open model network framework that characterizes the main traits pertaining to the nature of exploration in database art practices. Exploration is thus recognized as a prolific core of characteristics to be acknowledged in order to gain agency over the mediation of our data World.

Keywords: *Exploration, Database, Data, Art, Design, Digital, Media.*

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Resumo

A recolha, arquivo e manipulação de dados sobre nós e sobre o mundo é um aspeto da civilização humana que a tecnologia digital veio exponenciar. A ascensão da base-de-dados como repositório das dinâmicas do mundo conduziu as práticas artísticas a proceder à sua exploração como material de base e meio conceptual nos seus projetos. Uma análise global das práticas relativas aos dados e às bases-de-dados fez emergir a exploração como conceito chave e abordagem fundamental nos seus processos. Esta particularidade conduziu-nos a desenvolver uma investigação sobre a natureza da exploração no contexto das práticas artísticas relacionadas com as bases-de-dados.

A nossa abordagem inicia com a definição de um campo de estudo cujos artefatos se nos apresentaram sob uma diversidade de categorizações tais como *Information Art, Data Art, Data Visualization* ou *Information Visualization*. O estudo propõe agrupar estes artefatos numa categoria unificadora que concerne a exploração artística da base-de-dados, procedendo ulteriormente ao seu refinamento através do processo de recolha de dados, identificando-a como Database Art Practices.

De forma a analisar os dados coligidos, o estudo estabelece um conjunto de pressupostos relativos a caraterização da exploração. Estes têm origem em abordagens exploratórias aos dados oriundas da investigação na Ciência e nas Humanidades, da Estatística, de noções românticas em relação aos exploradores e à exploração, e finalmente recorrendo ao ramo da exploração em design desenvolvido por Daniel Fallman no seu modelo de Investigação em Design de Interação.

Através da análise dos dados recolhidos elaborada sob a perspetiva do conjunto de pressupostos pré-estabelecidos, o estudo permitiu a confirmação e o refinamento dos nossos pressupostos no sentido da definição de um sistema de categorização a partir dos dados. Este permitiu-nos formular um modelo aberto caracterizando os principais aspetos relacionados com a natureza da exploração nas práticas artísticas relacionadas com as bases-de-dados. A exploração é assim reconhecida como um núcleo prolífico de características a ter em conta no agenciamento da mediação de um Mundo de dados.

Palavras-chave: *Exploração, Base-de-dados, Dados, Arte, Design, Digital, Media*.

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Introduction

> *Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding. (Gibson 1984:69)*

> *The value of what is stored in databases lies in how it can be used in the present, and in its operationality rather than its meaning. (Brouwer & Mulder 2003:5)*

William Gibson's literary reading of data and databases as the source material of cyberspace, a space he created by transforming a data matrix into a landscape and thus explore its potential as a stage for his futuristic narratives (Hayles 1999:38), embodies the motivational and poetic backdrop behind our study. This arresting notion of Gibson's fictional dataspace, a place in which humanity and computer artificial intelligences conflate in oceans of data, is at odds with a utility discourse regarding data's face value in our knowledge society, and peoples' agency, or lack of it, as explorers upon this world that presents itself before them as a huge constellation of databases right out of a science fiction novel.

Dataspace, the adventurous last digital frontier for Gibson's console cowboys, also gives us a glimpse of data dystopia, because after all, in our real world, if the history of people's constitution as abstracted, surveilled and controlled data entities goes back to Industrial Revolution's mass society, the dynamics for the data collection, and the ever pervasive data typologies involved are novel and powerful. Jer Thorp (2011) argues that we are existing in a world where data is being collected about us on a massive scale, and currently being stored, analyzed and monetized by corporations, with little or no agency for the people to whom the data is supposed to belong. Much of the data exploration going on in the projects and in the field of study that our research inquires, offer commentaries that attest to this problematic, and attempt to provide frameworks—social, political, intellectual or technological—for people to regain sovereignty and agency over the collection, storage, and manipulation of data about themselves.

> *Archives are waiting for us as a huge giant asleep. If we wake the giant, what is it able to tell us? What language will it speak? Will we be able to understand the dreams it has in its mind? And, the giant grows and grows by interconnections. Will it be a force stronger than ourselves? (Smeulders 2002:330)*

On the impossibility of answering these questions, Arnold Smeulders goes on imparting an overview on the current implications of content-based retrieval in databases that aren't yet carried around in our daily garments and bigger than the life-long capacity of the senses. Nevertheless, ever since the already computerized societies went into a digitizing craze (Manovich 2002:224), sooner the totality of human knowledge will be comprised to digital form and lay dormant beyond human perception and cognition in an endless database. Smeulders huge sleeping giant is already here, and although maybe still half-asleep its slowly awakening is revealing data's entanglement with every aspect of our existence.

Victoria Vesna (2000) states that we are immersed in the second wave of information overload, and that this one is a real "tsunami" when compared to the first one, the not so distant invention of the printing press.

The commitment of knowledge to materiality such as printed books, paradoxically represents a phenomenon that goes back further in the past and that Brett Stalbaum (2004a) refers to as the disembodiment of information. It is precisely phenomena such as the abstraction of real-world objects, or people, into discreet data and its information surplus, that is the distant root of todays duality debate between data laying around in colossal archives and databases, and the reality to which they are supposed to refer to.

To Stalbaum, in a large sense, the Cuneiform Tablets of clay, inscribed in ideograms and numerals in a column and row format, are the first spreadsheets that form the material basis for the disembodiment of material reality into physical media for purposes of storage and trivial business transactions. He claims that one could go even further to argue that the first written words and images instantiate a similar disembodiment that is inherent in language itself, and that has been a constant issue in aesthetics from Plato's *mimesis,* through semiotics, and in post-modern thought in Jean Baudrillard's *simulacra,* in which the sign becomes ascendent and replaces reality through precedence.

Stalbaum states that data and information have qualities of their own as calculable symbolic representations that capture the measurable aspects of reality and they are not only disembodied in some material form of representational abstraction from their subject but can also be recorded and transferred in between states, propagated between individuals and places across linguistic and or digital or analog computational networks or other communicational infrastructures. He adds that the mobility of information is a matter of fact from the moment that linguistic messages and numerical representations started to be transported by human means from one place to another, and that the difference that makes the difference with digital technology it is the implementation speed in the relation between technology and materiality, from hand-written clay tablets, to sailing ships, to trains, the telegraph, and light speed in optical cables and radio networks, a radical increment in the transmission speed of information that expands its capacity to impinge materiality in milliseconds on a global scale (Stalbaum 2004).

Data, Information, Archives, Databases, what exactly are we talking about? What is a database and how entangled are its roots in our society? Lev Manovich (2002:218), commenting on his use of the term database, borrows on computer science to define the database as a collection of structured data in order to be rapidly sorted and retrieved using a computer, in that way standing as something more than a simple collection of items. Christiane Paul (2007:95) states that while the database is commonly understood as a computerized form of record-keeping, it is essentially a structured collection of data that stands in the tradition of other type of data containers such as a book, a library, an archive or a Wunderkammer, and that every container of information ultimately constitutes a dataspace and information architecture of its own, even though its characteristics are quite different from the virtual dynamic dataspace that the computer brings to the database context.

Selena Sol (1998) goes further back in time to the collective memory banks of oral history, referring that in the primitive and "barbarian" days before the computer, the amount of information shepherd by a group of people would be collected in the wisdom and the stories of its elders, in a world in which storytellers, magicians, and grandparents were honored storehouses for all that was known, its minds accessed in campfires by the younger members of the community using strings such as "TellUsAboutTheTimeWhen".

As a consequence, like a sweeping and rapidly-encompassing viral infection, came agriculture, over-production of food, and the origins of modern-day commerce (Sol 1998), and after that came wealth, and with wealth more data, and writing to cope with it, and books to cope with writing, and libraries to cope with books, and very smart systems to retrieve those books and the data in them from the constantly growing libraries, and then finally, the computer, that deals with huge amounts of data and at the same time turned the data production universal.

The information overflow that asks for the development of a specific philosophy in relation to handling large amounts of data (Vesna, 2007:ix) has also specific conceptual implications that soon arise in different artistic practices concerning database exploration, particularly those dealing with significant amounts of data. Whether critically engaging on the sociopolitical or socioeconomic aspects of the database,

seen as a repository of the world's dynamics, or exploring the relationships between the virtual data-bodies and their impact on physical materiality, the previously hidden complexity pertaining databases, so large that exist beyond human perception on a 'non-human' scale, (Manovich, 2000) is finally under exploratory scrutiny.

Database practices' scope of action and source material is then this massive digital archive, growing at an exponential rate and showing an incessant voracity for all sorts of data, spanning from the social, political and economical realms to the entrails of our personal privacy and consuming habits. Every aspect of our daily lives is recorded, and the existence of objects, humans and machines traced across the space-time *continuum*. As crucial as finding dynamic ways to interface this new cultural form, is to develop a critical approach from which to mediate a proactive relationship with such proliferative phenomena. An exploratory overview of database use and the nature of exploration in artistic practices is what we are proposing with this study.

Question

The Nature of Exploration in Database Art Practices is the driving question to our study. Its formulation led us to focus our research into two main areas of inquiry with the intended purpose of providing an exploratory overview of database use and the nature of exploration in artistic practices.

In a first instance, and playing the part of a motivation for this project beyond William Gibson's prescient literature, there was a collection of individual projects that made use of data as their source material. That data was shaped and explored through burrowed knowledge and skills from different fields of work such as Computer and Information Sciences, Design, and Art. This collection of projects and its authors were identified under a diversity of sometimes interchangeable categorizations such as *Information Art, Data Art, Data Visualization* or *Information Visualization.* For the sake of inclusiveness and due to the interdisciplinary nature of the contributions to this field, the study opted to group this diverse output under the umbrella of Database Art, understood as the context that these practices explore and that as such, in this study, are termed Database Art Practices.

In a second instance, our research aimed at the definition of Exploration, and of exploratory, in the context of data, data-related, and database-related practices, aiming to delineate a provisional categorization of aspects that could contribute to the characterization of what exploration in this context might mean. In order to gain

an understanding of exploratory approaches to data or data-related practices, the study draws from the fields of general research in Science and the Humanities; from John Wilder Tukey's (1977) Exploratory Database Analysis in Statistics; from Romantic notions relating to explorers and exploration; and particularly, from Daniel Fallman's (2008) formulation of Design Exploration as a branch of his Interaction Design Research model.

Literature

The question addressed in this study led us to focus its literature review into two main areas. As referred, initially and as a motivation for this project, there was a collection of projects that worked with data as a material, and that borrowed knowledge and skills from different fields of work. The aforementioned projects and their authors came to be identified under a diversity of sometimes interchangeable categorizations such as *Information Art, Data Art, Data Visualization* or *Information Visualization.* Inclusiveness and the interdisciplinary nature of the contributions to the field, made us opt to group this diverse output under the umbrella of the Database, understood as the context explored by these practices and that as such, in this study, are termed Database Art Practices.

The first part of the literature review, designated The Database, provides an overview of several aspects relating to the database, from its inception in the corporate discourse to its coming to the fore in popular culture; its historical antecedents that relate to a general phenomenon of abstraction of the real and its conversion into all sorts of codified signs and languages that needed to be stored and later circulated through communicational channels; the database entanglement with a range of social and economical aspects of our relation to the world, to each other, and to the institutions that govern our existence; the rise of the database under the exponential growth of digitization, and its operationalization through digital technology and global networked communications; and particularly, the data, and the database

relation of interdependency with Nature and Humanity, turning it into an unavoidable material of indisputable interest to artistic practices that question conventions to find new forms of expression by developing an aesthetic, an ethic and a poetic of the exploration of the database.

The second part of the literature review aims at the definition of exploration, and of exploratory, in the context of data, data-related, and database-related practices, in order to delineate a provisional categorization of aspects that could contribute to the characterization of what planned or strategic exploration in this context might mean.

As referred in the formulation of the study's question, in order to gain an understanding of exploratory approaches to data or data-related practices, the study draws from the fields of general research in science and humanities; from John Wilder Tukey's (1977) Exploratory Database Analysis in Statistics; from romantic notions relating to explorers and exploration; and particularly, from Daniel Fallman's (2008) formulation of design exploration, a branch of his Interaction Design Research model.

The Database

> *"In the age of information overload, the primary concern for many knowledge areas becomes the organisation and retrieval of data. Artists have a unique opportunity, at this historical juncture, to play a role in the definition and design of systems of access and retrieval, and at the very least, to comment on existing practices."*
> *(Vesna, 2000)*

Vesna (2000) states that we live in an era of information overload, permanently immersed in a vast ocean of data that grows exponentially and reconfigures in an infinitude of possibilities. A real storm in a global scale that leads Vesna to add that if we consider the invention of the printing press the first wave of information overload, we can clearly consider ourselves immersed in the second, "tsunami" wave.

Time and space, Mark Poster states (1990:2-3), no longer constrain information exchange rendering McLuhan's "global village" technically feasible and having such profound effects on society whose pervasiveness and full-scope extent are yet to be determined. He adverts that space and time conquest by electronic media brings more to institutions and theory than a simple returning of practices and ideas to the new communicational channels. Electronic media propose new theories but also a re-evaluation regarding the several stages of communication that coexist in contemporaneity. Poster (1990:5) refers to the implications of the introduction of new communicational media and its profound influence in the social fabric by quoting Carolyn Marvin's work (1988:4), when she demonstrates that the spectrum of influence caused by the introduction of the telephone goes beyond long distance communication and the consequential space-time fragmentation, by threatening existing class-relation systems, altering the scope of communication between people from different classes or, on a different level, altering the modes of courtship opening new possibilities for romance.

Nevertheless, what Poster defines as a "culturalist perspective" and recognizes as an important step forward in communication studies, it won't, in his opinion, go far enough in questioning the theoretical and disciplinary paradigms of the new communicational forms. He states that electronic communications require a theoretical framework capable of decoding the linguistic dimension of the new forms of social interaction, and offers the new concept of the "mode of information" to have it done, playing upon Marx's "mode of production" theory, and similarly suggesting that History may be divided in periods by variations in the structures of symbolic exchange, but also that we live in a current culture that elevates "information" to unprecedented levels of fetishistic importance (Poster 1990:6).

In the definition of the several stages that he proposes as coexisting in the context of the mode of information at an historical level, Poster (1990:6) goes across the several stages that correspond to the diverse structures of symbolic exchange—face-to-face, orally mediated, mediated by print—in order to reaffirm the idea that the electronically mediated exchange brings forward spaces of informational simulation that definitely contribute to an unstable, de-centered and dispersed self, and alters a set

of relationships between language and society, idea and action, self and other, that are central in every stage.

Starting from the idea that an analysis of the anatomy of the electronic mode of information will necessarily reconfigure the anatomy of the information modes that correspond to oral and print stages, Poster (1990:7) suggests some of the major areas of concern in the study of the mode of information, starting from the study of the forms of information storage and retrieval, from cave paintings and clay tablets to computer databases and communication satellites. According to Poster (ibid), every method of information transmission or preservation has a profound effect in the network of relationships underlying society, and that when that society attains a certain dimension, government and expansion is only possible through written records, and an information system, that is cheap, reliable and durable is crucial to the empire and its economic and military sectors.

Communication media have close and interdependent connections with other areas of society and establish a symbolic association to the contemporary context of the mode of information. Poster states that political events, the forms of community, and economic systems are all coordinated with communication media, and paraphrases Marx's associations of the windmill to feudalism, and the steam engine to capitalism, to suggest electronic communication as associated with the mode of information. Furthermore, Poster claims that the reconfiguration in the modes in which language is channeled, that he terms "wrapping of language", significantly changes the way the subject processes signs into meanings and consequently its relationship with a world in which the function of representation is problematic and characterized by a referential crisis.

Poster states (1990:13) that the function of representation comes to grief when words lose their connection with things and come to stand for them, and what we're left with is language representing itself. Language's self-reference issue and its elasticity is particularly present in money and its oscillation as a plastic pseudo-materiality and the corresponding electronic information in bank databases—turning money into a variable convention whose referent is now hard to discern. Poster (1990:13) quotes Frederick Jameson (1981:60-61) when he laments the level of mystification in

contemporary society, as a result from what Jameson believes to be the very vehicle of that mystification, the "explosion of information", to which Poster adds the determinant influence of the new structures of communication in which information circulates and that undermine structures with more than two centuries of implementation. Poster states:

> *"Beyond a certain point, increased distance between addressor and addressee allows a reconfiguration of the relation between emitter and receiver, between the message and its context, between the receiver/subject and representations of him or herself. These reconfigurations, which I call wrappings of language, in turn impose a new relation between science and power, between the state and the individual, between the individual and the community, between authority and law, between family members, between the consumer and the retailer. In sum the solid institutional routines that have characterized modern society for some two hundred years are being shaken by the earthquake of electronically mediated communication and recomposed into new routines whose outlines are yet by no means clear." (Poster 1990:14)*

According to Poster, to the unstable fragmented subject of electronically mediated communication the object no longer refers to material reality as represented in language but the very own flux of signifiers, in an increasing state of abstraction and disembodiment of its own self, of its identity and of its relation with the real. Poster calls it a process of reconfiguration of their own subjectivity, of their relation to the world of objects, and with the perspective and its place in that world, that goes beyond McLuhan's reshuffling of the senses, into a generalized state of destabilization of the subject, dispersed in remote communication, multiplied by databases, decontextualized and re-identified by TV advertisement, continuously dissolved and materialized by the electronic transmission of symbols, its dispersion across social space transforming them into the rhizomic nomads enunciated by Deleuze & Guattari (1987). A subject no more rooted in space-time coordinates and freely wondering through the globe, overcoming its body as an effective limit of its position as a subject in the world, its nervous system extended through communication facilities throughout the earth, into a Teilhard de Chardin's (1961) noosphere of language (Poster 1990:15).

To Charlie Gere (2002), the abstraction or semiotization of reality is tightly connected to the promotion of the circulation of signs that result from the industrial processes, leading to the development of representation and communication technologies with levels of unprecedented sophistication and establishing a definite relation between capitalism and information and communication technologies. About this relationship Gere (2002:35) states that it was the colossal expansion of capitalism that promoted the creation of technological media to deal with the increasing quantity and complexity of information that companies had to manage, not only regarding the production and communication of signs but also its storage, its retrieval, and the conversion of other phenomena into manageable signs.

According to Gere, with the Industrial Revolution we also witness the process of the semiotization of people, that are now aggregated in urban centers in a new mass society. Gere quotes Michel Foucault (1977) on the power of examination and documentation as an important part of the mechanization of discipline, to refer to the people's transformation into discreet units of information, subject to examination and documentation in order to be controlled and disciplined, its information transmitted, circulated, manipulated and compared, in a process that culminates in the ten-yearly enumeration of a country's population and the largest scale example of such endeavors, the Census.

Gere (2002:37-38) regards the Hollerith tabulating machine (1890), used in the census and allowing for the processing and sorting of large amounts of information, as one of the major technical developments in the way to the modern electronic computer, and an exemplary product of the disciplinary panoptic society described by Foucault. He adds that in its system, individuals are converted into discreet digital units, its individuality rationalized and normalized into a homogenizing sign system, that transforms them into a mass of interchangeable and manipulable data, stored and archived in colossal and ever-growing databases.

DeLanda (2003:9) argues that Michel Foucault's approach to the archive is in large part an attempt to answer the question that relates to the archiving process guided by a deliberate strategy operating outside the problematic of legitimacy. That hap-

pened as a turning point in time when the threshold of description was lowered to include information pertaining common people, and through a process of the objectification of the subjects as unique singular individuals, whose history could now take the form of a file in a case mapping its deviation to the norm (DeLanda 2003:11).

He quotes Foucault's pervasiveness of the archive for disciplinary intents, an archive that is now regarded as something to operate upon, something that impinges on the future of its subjects: *"For a long time ordinary individuality - the everyday individuality of everybody - remained below the threshold of description. To be looked at, observed, described in detail, followed from day to day by an uninterrupted writing was a privilege … The disciplinary methods reversed this relation, lowered the threshold of describable individuality and made of this description a means of control and a method of domination" (Foucault 1979:191).* And that what is archived *"is no longer a monument for future memory, but a document for possible use. And this new describability is all the more marked in that the disciplinary framework is a strict one: the child, the patient, the madman, the prisoner, were to become, with increasing ease from the eighteenth century and according to a curve which is that of the mechanisms of discipline, the object of individual descriptions and biographical accounts. The turning of real lives into writing is no longer a procedure of heroization; it functions as a procedure of objectification and subjection" (Foucault 1979 191-192).*

DeLanda (ibid. 13) argues that the debate over the degree of computer users' anonymity on the Internet, particularly pertaining their transactions with institutions and their interactions with each other relate directly to Foucault's conception of individual identity, as do the proposed cryptological solutions to privacy problems, by conveying what he terms a "technology of disconnection" that will assist us in acquiring a higher degree of agency over the flow of ones information archiving, and ones compulsory objectification through archival identities.

Arjun Appadurai (2003:16) acknowledges Foucault's role in destroying the innocence of the archive by forcing us to ask about the designs through which its traces are produced. He mentions that Foucault's work on the clinic, the fingerprint and the physiology of crime shows us that all evidence results from some sort of noso-

logical gaze, and that that turns the archive into a collective tool whose panoptical functions reflect its roles as an accessory to policing, surveillance and government probing. Nevertheless, Appadurai (ibid.) states that Foucault's darker vision of the archive can be balanced by personal uses outside the purview of the state in the context of the creation of documents and their aggregation into archives as a part of everyday life, such as the personal diary, the family photo album, the community museum, the libraries of individuals, and other examples of popular archives as intentional repositories of human history.
From this point of view, Appadurai argues for the archive as a field for intervention and part of some sort of collective project that is itself an aspiration rather that a recollection, a material site of the collective will to remember, rather than the tomb of the accidental trace imbued in the officializing mentality of the nation-state (ibid 16-17).

Arguing on the relation between signs and things, Brett Stalbaum (2004a) states that information and data were always disembodied, but also that the interaction between the virtual and the real that characterizes the turn of the Twentieth Century has no precedent in History. He claims that that disembodiment it's not the difference making the difference that the digital age brings, but rather the nature of the distributed, high-speed data processing, because it radically motorizes, automates and makes ubiquitous the potential for data and information to impinge on our daily lives.

Stalbaum (2004a) quotes Edwin Hutchins' study (1995:124) of how representations are propagated in systems of cultural computation, compiled in his Cognition in the Wild (1995), when he points out that the use of bearing logs by seamen in navigation is at least 4500 years old in Western cultural tradition and that the Sumerian accountants developed similar layouts for the recording of agricultural transactions as early as 2650 B.C. To Stalbaum, in a large sense, the Cuneiform Tablets of clay, inscribed in ideograms and numerals in a column and row format, are the first spreadsheets that form the material basis for the disembodiment of material reality into physical media for purposes such as storage and trivial business transactions. He claims that one could go even further to argue that the first written words and images instantiate a similar disembodiment that is inherent in language itself, and

that that has been a constant issue in aesthetics from Plato's *mimesis,* through semiotics, and in post-modern thought in Jean Baudrillard's *simulacra,* in which the sign becomes ascendent and replaces reality through precedence.

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Poster (1990:71) quotes James Rule's (1974:273) study of record keeping in major institutions in which he concluded that databases allow a detailed reconstitution of the daily activities of any individual. Standing as the major container of language from the mode of information, its linguistic qualities and its corresponding political implications are, in Poster's (1990:87) opinion, better analyzed and understood in light of the interdependency between language and action in Foucault's theories. What Poster calls today's "circuits of communication", inherent in his mode of information, and the databases they generate, constitute a reinforcement of Bentham's Panopticon, enunciated by Foucault. In fact, Poster argues, it updates it in a Superpanopticon, still a system of surveillance, but this time without walls, windows, towers and guards, in a system in which technology is only part of the process, because the "populace" not only is disciplined to surveillance as it actively participates in the process, happily engaging in an endless form completion from its own home to feed the databases of the consumer society (Poster 1990:93).

In accordance with Gere (2002), Poster refers Marx's analysis of the reorganization of labour by capital in the industrial revolution, and the repositioning of its bodies from the field to the factories and later the assembly lines, and similarly the reorganization of daily-life from the 1920s onwards, in which individuals are constituted as consumers and as participating in the disciplining and surveillance of themselves as consumers (Poster 1909:93). In accordance with Stalbaum (2004a), Poster states that what gives the databases their effectiveness is not only their non-ambiguous grammatical structure but also their electronic coding and computerized storage. These allow for the data in electronic form to be sorted and searched with breathtaking speed, millions or records a second, practically at the speed of light, replacing the discourse/practice of the Panopticon as a biopower mean of controlling the masses for the development of industrial processes, by the Superpanopticon discourse of the databases, that control the masses in the postmodern, postindustrial mode of information (Poster 1990:96-98).

Dholakia, Zwick & Pandya (2005:170-175) reading of Poster's critique of the condition of humans located in database matrices, and the corresponding emergence of new forms of institutional and organizational power, identifies two camps commenting on the implications of Poster's new mode of information, one libertarian and the other a Marxist point of view. While the libertarians are concerned by the threat that personal information-filled databases pose to the end of privacy for citizens and of free choice for consumers, Marxists worry about the domination of the working class by corporations seizing information technologies' computer networks and database technologies to further monopolize and control the means of production (2005:172).
They acknowledge the contributions to the understanding of the impact of information technology on personal freedom, consumer sovereignty, and the power of the worker that both viewpoints offer, but highlight Poster's argument of their failing to grasp the cultural innovations brought by the integration of databases into existing political, economic, and social institutions, because, as he argues, they minimize the importance of language towards a theorization of the social field primarily based on action, and quote Poster (1995) when he states that as databases are configurations of language, the theoretical stance that engages them must at least take this ontological fact into account.

Dholakia, Zwick & Pandya (2005:173-174) sum-up borrowing from Poster's reading of Foucault's Panopticon, referring that databases form the basis of the panoptic marketspace, and point out the need to understand and counteract the ways in which consumers are dataveilled, a term by computer scientist Roger Clarke (1998) that implies the monitoring of people by digital representations in electronic databases created and managed by information technologies, and thus fabricated as data objects, and acted upon to gain control over their behaviors. They state that any political action that aims to curtail the power of the panoptic marketspace must take place at the level of the database, and discuss the policy implications regarding consuming dataveillance by arguing that consumers must be given direct access to their records in the database to ensure their voice in the process of their own constitution as digitized customers, in accordance to Poster's (1990:98) opposition to the motto "all information in all places at all times" through its proposal of a strategy following Jean-François Lyotard's conclusion to his The Postmodern Condition: A Report on Knowledge (1979) to "give the public free access to the memory and data banks" (1984:67).

According to Richard Rinehart, (2004) database and interface have been named the twin poles of digital media, as digital manifestations of memory and expression. Rinehart states that the database, a term coined in the 1970s with the advent of computation and the rise of office automation procedures (Cook, Dietz & Kiendl 2005), has its roots in traditions such as the Greek encyclopedias, the Alexandrian archives, the Cabinets of Wonder or Wunderkammer of the Renaissance, and the collective memory banks of oral history, assuming a dominant role in the modern era as the main repositories of information and a latent potential for multiple meanings by the way its contents are accessed and interfaced, because as Rinehart points out, 80% of all the content on the Internet is estimated to be contained below the surface in the deep-web of databases.

Richard Rinehart claims that it is through interfaces that build on traditions of storytelling, data-visualization, or cartography, as acts of interpreting, communicating, or giving life to information, that the exploration of data-driven art forms is being made, by artists that tap into existing databases, creating new social meaning from

its industrial and commercial contents through data-narration, data-visualization, and even data-poesis (Rinehart 2004).

Commenting on his use of the term "database", Lev Manovich (2002:218) borrows on computer science to define the database as a collection of data that is structured in order to be rapidly sorted and retrieved using a computer, and consequently standing as something more than a simple collection of items. Looking for a definition of the database and the entanglement of its roots in society, Christiane Paul (2007:95) states that while the database is commonly understood as a computerized form of record-keeping, it is essentially a structured collection of data that stands in the tradition of other type of data containers such as a book, a library, or an archive. To Paul (ibid), although this precursors of the computer database constitute a dataspace and information architecture of their own, its characteristics are quite different from the virtual dynamic dataspace that the computer brings to the database.

Selena Sol (1998) goes further back in History to the collective memory banks of oral history, referring that in the primitive and "barbarian" days before the computer, the amount of information shepherded by a group of people would be collected in the wisdom and the stories of its elders, in a world in which storytellers, magicians, and grandparents were honored storehouses for all that was known, its minds accessed in campfires by the younger members of the community using strings such as "TellUsAboutTheTimeWhen". And then of course, Sol (ibid) proceeds by adding that like a sweeping and rapidly-encompassing viral infection, came agriculture, over-production of food, and the origins of modern-day commerce, and we would add that, after that came wealth, and with wealth more data, and writing to cope with it, and books to cope with writing, and libraries to cope with books, and very smart systems to retrieve those books and the data in them from the constantly growing libraries, and then finally, the computer, that deals with huge amounts of data and at the same time turned the data production and management universal.

Sol (ibid) states that almost instantly, the computer was applied to the age-old problem of information storage and retrieval and that by World War Two, information was already accumulating at rates beyond the space available in publicly supported libraries seeping out of every crack and pore of modern day society.

To Manovich, one possible characteristic specific to the database would relate to terms such as scale, complexity, size and density. He goes on stating that one essential difference between a computer database and earlier similar forms for organizing data, such as a picture album, catalog, an archive, a library, and an encyclopedia, is that the earlier forms still had a human scale. They contain a limited number of records, which a user can directly access. One can turn the pages of an album, walk through an archive, browse through a library. In other words, the human body is still sufficient as an interface (Manovich, 2000). To Manovich (2007:40), different types of databases—hierarchical, network, relational and object-oriented—use different models to organize their data, and even if new media objects use this highly structured database models or not, they are, from the point of view of user's experience, databases in a more basic sense, because he argues that if we follow Erwin Panofsky (1927) analysis of linear perspective as a "symbolic form" of the modern age, we may call the database the new symbolic form of Lyotard's (1979) computerized society, and a new way to structure our experience of ourselves and of the world.

Manovich (ibid.) ends by adverting that if after the "death of God" (Nietzsche 1882), the end of grand Narratives of Enlightenment (Lyotard 1979) and the arrival of the Web (Berners-Lee 1989), the world appears to us as an endless and unstructured collection of images, texts, and other data records, it is only therefore suitable that we model it as a database, and consequently, develop an appropriate Poetic, Aesthetic, and Ethic of that database.

Brett Stalbaum (1999) writes in the Switch editorial dedicated to the database ontology an its implications in the artistic practices that its proliferation and intertwining in the Western cultural fabric is one of the most important developments of the Twentieth Century, and that the rise of the great corporation giants such as Microsoft, Amazon, Sun Microsystems, Wal-Mart, AOL, and Oracle, but also the Internet, are amongst the great manifestations that one way or the other reaped the benefits of the database. He states that every area that relates to organization, inventory, process, distribution, and financial management has the database at its core, and that the database allows an increment in productivity that it's cultural significant and that ultimately reflects itself in the material world of the circulation

of products, establishing a strong dynamic between the immaterial world of digital information—the world of bits—and the atomic materiality of the real. Furthermore, he adds that the roots of this revolution can be traced through figures such as George Boole, Charles Babbage, Ada Lovelace, Kurt Gödel, Claude Shannon, Alan Turing and E.F. Codd, even if the changes have been most intense in the very recent past.

Manovich (2001:220) points out to the Internet as the place where the database really flourished and where the formal aspects of the database acquire its full relevance and pertinence, a web page as defined by its original HTML code being a sequential list of individual elements such as text-blocks, images, digital video clips, and links to other pages, in which is always possible to add new elements to the list, simply by open a file and type a new line of code, most pages being a collection of separate elements, such as photographs or even a collection of links powered by a search engine.

To him the Web is a fertile place for the implementation of existing database typologies as is the case with bibliographies or image banks, but also allowing for the creation of new genres, for example Tribute Websites, most of the time only constituted by a set of links to other pages on the same phenomena in an endless thread of hyperlinks. The Web's open nature as a medium that is always in a process of construction and reconstruction emphasizes its fragmentary aspect and contributes to what Manovich (ibid:221) calls the anti-narrative logic of the Web stating that if new elements are constantly being added over time, the result is a collection, not a story. And indeed the rise of the Web, that Manovich (ibid:225) calls a gigantic and always changing data corpus, gave millions of people a new occupation as data indexers or archivists, in which every website features at least a set of connections to other websites turning them into a type of database and where the most large-scale commercial giant websites are no more than web front-ends to their company's commercial databases. This leads Manovich to refer to the re-writing of Jorge Luis Borges' story (1998:325) about a map the size of the territory it represented as a story about indexes and indexed data in which the map has now become larger than the territory it represents.

Discussing the issues concerning databases and narratives, and the acknowledgement of the former and its proliferation as a prevalent cultural form, leads Manovich (ibid:227) to assert the database as the center of the creative process in the computer age. He refers that historically, interface and artwork were one and the same, the artist produced the artwork in a particular medium with a unique interface that was the work by itself, while in database culture a multiplicity of interfaces can present several ways to access the same artwork, presenting different versions and different aspects of the same piece, in this way establishing a new paradigm of variability in new media objects that Manovich states as consisting in one or more interfaces to a database of multimedia materials.

However, reflecting on how far the database formal structure is inherent in modern storage media, Manovich (ibid:233) refers the example of the database impulse present in the photographic body of work of William Fox Talbot's Pencil of Nature, in Face of Our Time, August Sander's monumental topography of modern German society or in the obsessive cataloguing of water towers obeying to a strict formal program of self-resemblance present in the work of Bernd and Hilla Becher, as evidence of non-universality in the connection between storage media and database forms. In fact, in his analysis of the historical precedents of the database and by establishing a polarizing relationship with the narrative form, Manovich states that until an organization in alphabetic form became popular a few centuries ago, most encyclopedias were organized thematically, and that many founding narratives of the Western tradition, such as Cervantes and Swift novels or Homer's epic poems seem to traverse an imaginary encyclopedia.

In an interview with Inna Razumova (2000) when questioned, in the context of the database in the pre-modern era, if he considered the Greek mythology as Homer's Iliad imaginary encyclopedia, Manovich answers by stating that in fact he considered Greek mythology as a database that "supports" Greek narratives and that we can extend this logic to think of every iconographic system (for example Christian references or classical Western art) as a database that allows for the generation of particular narratives.

According to Manovich (ibid:234) the alternation between narrative and database forms relates to the typology of objects that every media implies. He states that photography, for example, is a medium that outputs isolated and dispersed units of meaning, and as such privileges its organization in collections, catalogues, taxonomies, and lists that were contemporary with the narrative forms of the novel and historical narrative academic painting of the Nineteenth Century. Moving images in Film, he adds, privilege narrative, almost all fiction films, with a few exceptions, being narratives, and the next storage media of computer-controlled digital storage devices such as hard drives and removable drives, privilege the database once again. Furthermore, the assessment of the proliferation of multimedia encyclopedias, virtual museums, pornography, library databases, and of course, the Web itself, constitute, to Manovich, evidence that the database is as popular as ever before, turning the digital computer—in itself a "database" and interface to databases—the perfect medium for the database form.

Dietz (2007:117) states that there will be always a tension between the complete description of a specific individual and a generalized description of a group, and that one way to go beyond just the facts is to tell a story. Dietz indirectly comments upon Manovich's reasoning on the relationship between database and narrative, particularly his assertion that database and narratives are natural enemies competing for the same territory of human culture, and claiming exclusive rights to make meaning of the world (Manovich 2001:225), by quoting the linguistic researcher Walter Ong as having determined that Homer substituted a stock set of phrases according to identifiable regular occurrences. Dietz adds that if this is not the same as saying that the Iliad is a database-driven hypertext, at least it hints that storytelling and the database logic of information systems are not inherently incompatible.

Paul (2007:100-101) also builds on Manovich's assertion to point out that narrative and database are not necessarily mutually exclusive forms, and that computer games, as an example, are often narratives whose building elements are still organized in a form of database structure, and that an interactive narrative or hypernarrative can be understood, and she puts it in Manovich's own words: the sum of multiple trajectories through a database (Manovich 2001:227). What Paul (2007:101) points out is that the categorization of information within a database lends itself to

be filtered to create meta-narratives about the construction and cultural specifics of the original material, and that its characteristics as a collection of information that can be structured according to various criteria and the resulting meta-narratives, are different from the concept of the traditional narrative in the broadest sense, where a sequence of events or of defined relationships is established (Paul 2007:106).

Eugene Thacker (2000) highlights the capacity of new media to propose new forms of communication through standardization, and new meanings for hearing, seeing, and writing, by effecting in their own particular way, the arresting and storing of sensory phenomena, that Friederich Kittler (1987) in its Gramophone, Film, Typewriter, brings up as the ways in which the media revolution of the Nineteenth Century created a connection between the new technical modes, power and history, and the realm of the dead and the phantasmatic. He proceeds by stating that between power and phantasms, and between history and the dead, there are the storage media of the gramophone, film, and typewriter. For Thacker (ibid), the mediation of history and the dead results in the archive and the document that gathers, filters, and organizes the multiplicity of people, cultures, events, cartographies that constitute the document as a representational tautology—the document authenticating and verifying itself as a fact.

To Thacker (ibid), this is made possible by the capacity of these media to capture, translate, and store information into an archive, the formal structure of mechanical storage—of the gramophone, film, and typewriter—or using what Thacker terms as a modern re-contextualization of the partially-connected archive, into a totally connected database, the formal structure inherent to digital storage and computer memory. He adds that while the archive stands in its best part as stable and non-susceptible to modifications—as is the case of printed records, gramophone discs, filmic and photographic plates, and typeset pages—the database is defined by its flexibility in the handling of information, in which everything can be changed, altered, contaminated, corrupted, and manipulated, and thus also implying the need for back-up storage, data encryption and security.

Thacker (ibid) states that the transition from the formal structure of the archive to the formal structure of the database, from mechanical media storage processes to

digital media, from partially connected systems to totally connected ones, implies for Kittler, a complex operation upon the body of subjects as they intersect and are integrated with media technologies. To Thacker (ibid) the database is not a mere repository of information: its function expands beyond the recording and preservation of information, and makes possible a series of potential extensions in turning the information productive, proliferative, morphological, organized, classified, and taxonomized according to a wide range of flexible uses, and ready to be reconfigured, recombined, commented upon, and explored almost infinitely in new emerging media systems.

As already stated, to Manovich, when compared to earlier similar forms for organizing data, the specificity of the computer database concerns their non-human scale. Computer databases are so complex in size and density that it is impossible to display them all at once. The human body is not enough to interface them, we have to use the computer to search, match, and sort among its millions of records that exist beyond the scale of human perception and cognition. It is this non-human scale that represents to Manovich the essential quality of the computer database, making them into something worthy of exploration in the reality of artistic practices. Besides that, he states that databases constitute the ideal technology for artists to represent the complexity of modern networked society, globally connected, and that as the new media forms in general, the database allows for a coexistence of different points of view, explored from different interfaces and accordingly different models of the world, different ontologies, and potentially different ethics (Manovich 2000).

According to Victoria Vesna (2000) communication technologies came to reinforce the artists' role since the beginnings of the Twentieth Century in deconstructing their own art world and institutions, and that the dizzying speed in which archives and database systems are being developed, turns them into the most promising field for conceptual work, to an entire new generation of artists and audiences that emerged along with those technologies.

Vesna (ibid) states that Marcel Duchamp's establishment of concept over art object, and his eventual decision to abandon painting to become a freelance librarian at the *Bibliotheque Saint Geneveive* in Paris, not only challenged the museum system,

questioning of what may be called and displayed as Art, but also emphasized the intersections between information and aesthetics. Vesna (ibid) refers the pervasiveness of communication media in our society to highlight its role in the creation of the artists' myth and media persona, that she believes being a central aspect to the artists' practice in an hyper-mediated society, allowing for the expansion of its work through self documentation, the recording of the work's context, and in many cases becoming the work itself.

Vesna (ibid) identifies Buckminster Fuller's *Chronofiles* and Andy Warhol's *Time Capsules* as paradigmatic examples of this practice, while H.G. Wells's *Vision of a World Brain,* Vannevar Bush's *Memex,* and Ted Nelson's *Xanadu,* as similar examples of database exploration, but more concerned in the way we organize and retrieve stored information.

According to Vesna, the history underlying the first wave of "information overload" that arrived with the introduction of the printing press, also brought along the first efforts in the Renaissance to organize knowledge and collections, and the sudden proliferation and distribution of books in a library system contemporary with the categorization of collection systems happening in museums. The intersection and clash of both systems, of libraries and museums, has in Vesna's opinion, happened consistently throughout their respective histories, the museums being object-oriented and acting as the classic keepers of visual memory, and libraries the keepers of textual memory. She states that Museums are limited by the very own materiality of their contents in relation to themselves as containers, their own architecture constraints—the building limiting their inclusiveness and the typology of the contained objects, their scale and type of collection—rarely accommodating ephemeral media. On the other hand, Libraries include all printed matter, including the one produced by museums, and are close to the inclusive research paradigm of academia.

Vesna (ibid) goes through this dynamic of intersections, limitations and categorizations to assert their fast dissolution through digital technologies and its capacity to store an array of objects that were traditionally separated by media or form, in a continuous flux of data, endangering the institutions that have been established

to store specific kinds of data and even the way that information is distributed in universities and learning contexts.

The introduction of computers and computer networks, particularly the Web, pose for Vesna as a new paradigm that defies the primacy of word over image by collapsing and dissolving the frontiers between archiving systems, not to speak of their impact in other institutions and the society as a whole. To Vesna, the organizational systems of museums and libraries are no longer adequate for the vast amount of digital data in contemporary culture, and new forms of information access and retrieval must be considered. Vesna highlights the inadequacy of their paradigms of information and culture storage, by citing Vannevar Bush (1945) when he says that the summation of human experience is being expanded at a prodigious rate, but the means we use for threading through the consequent maze to the momentarily important item is the same as was used in the days of square-rigged ships (Vesna 2000).

The *Memex,* or *Memory Extension,* proposed by Vannevar Bush as a concept in *As We May Think (1945),* poses as the first practical, accessible, and individually configurable storehouse of knowledge. The obsession for the knowledge sphere, for the forms of collective intelligence and for ways to theorize them and at the same time convey new technological devices for its manipulation, gains momentum in the scientific level and in the adjacent areas of humanities and social sciences around the same time. Parallel to Bush's *Memex* development, Wells's *World Brain,* a collection of scientific essays on the science of social organization he termed "construction sociology", proposes the resolution of the massive problems threatening humanity through well-coordinated thinking and research under a general idea of collective intelligence (Vesna 2000). Vesna states that the vision of collective intelligence, that Bush and Wells imagined through conceptualization, were prophetic of Douglas Engelbart's own realization of the same concept through the use of technology, pursuing Bush's vision and developing key innovations in computer technology. His seminal essay *The Augmentation of the Human Intellect (1962),* namely through the use of the computer, and J.C.R. Licklider's *Man-Computer Symbiosis (1960),* on the cooperative interaction between men and electronic computers, form the basis of a new thinking paradigm regarding Human Computer Interaction that would lead to the development of key technologies in computation, from computer graphics, to

word processors, conferencing systems, hypertext systems, mouse pointing devices, and computer communication networks for data transmission and asynchronous collaboration (Vesna 2000).

On the way to establish the computer's role as universal machine (Manovich 2001), and before the idea of associative access to information through computerized systems was overrun with Tim Berners-Lee *World Wide Web (1989),* Ted Nelson's connective structure *Xanadu (1960)* already integrated a form of hyper-textual bidirectional links—hypertext and hypermedia terms were coined by Nelson in 1965—he called transclusions. Vesna sees Berners-Lee creation of the Web as a huge infrastructure driven by the combined efforts of corporations and academia that finally achieves the vision inherent in Fuller's *Geoscope,* Bush's *Memex,* Well's *World Brain,* and Nelson's *Xanadu*.

Vesna refers to the *Great Library of Alexandria* as a legendary testimonial to the human drive to gather and codify knowledge, and, under what she terms the ghost of Alexandria, draws a parallel with projects with similar ambitions to collect and archive all of human knowledge, that are taking place both in academia and the private sectors. She names, for example, the Corbis Image Library, owned by Bill Gates's Corbis Corporation, and quotes Kate Hafner (1996) stating that Corbis CEO Doug Rowin had announced that the company's objective was to capture the entire human experience throughout history. On a totally different angle, she names Brewster Kahle's non-profit Internet Archive, that has been capturing and archiving every public Web page since 1996, or even in a domain that is much closer to ourselves as human beings, and that Vesna refers to as our own bodies as databases, she refers to two other projects of concern, the Visible Human Project, that digitized CT, MRI, and cryosection one millimeter interval images of a male and female cadavers, and the Human Genome Project, that maps the entire human genome to be stored in databases and further analyzed through software tools.

Vesna argues that although much of the ambition for digitized genomes is driven by the excitement of a new way of thinking and working and by a utopian vision of all information being accessible to Well's collective consciousness, it is also the case that biotechnology is a highly profitable field of work, and as such, issues can be

raised relating to who holds the rights to the data or even if some type of data—like the human genome—belongs to the public domain, and will be accessible to the public, or on the other hand, will be commodified and patented by large biotech corporations. She poses the question of what kind of role the artists whose practice relates to information and networks may have, and particularly, if they'll be able to achieve something meaningful, on both technical and aesthetic levels (Vesna 2000).

Commenting on database art practices, Vesna argues that, historically, artists have long recognized the aesthetic and conceptual potential of databases, and have developed work deliberately using archives and databases in their practices, sometimes as political and social ready-made commentaries.

As a first example, she mentions Marcel Duchamp's *Boîte-en-Valise (1936-41)* as the first critique to the museum practice, and in the 1970s and 1980s, other artists such as Richard Artschwager, Louise Lawler, Marcel Broodthaers, and Martin Kippenberger had, one way or the other, comment on museum practices, using its archives or its very own packaging procedures as conceptual mechanisms for their work, leading Vesna to comment that, ironically, sometimes the storage of fine art is more elaborate and careful than the very art it is meant to protect (Vesna 2000). Vesna also refers to Andy Warhol as an obsessive collector in his own right: his project *Time Capsule,* similar to Fuller's *Chronofile,* consisted of a multiplicity of documents from his daily life that, according to Vesna, and in a general sense, expresses an investment in the future of the artist's persona to survive in the form of information.

Vesna (ibid) states that collecting, storing and archiving is connected to the passing of time, and our anxiety over its loss in an age of relentless movement in which the creation of self-memory banks that testify our existence and inscribe our unique contribution in the world, is our only hope for a future re-contextualization of said data in a place of cultural importance. She mentions Antoni Muntadas as one of the first artists that used the World Wide Web in his project *The File Room (1994-),* allowing the public to submit their own experiences of censorship, and in this way documenting and making accessible information that wouldn't be available at all or would exist somewhere as dormant data.

Vesna (ibid) claims that ultimately, artists working in digital media operate necessarily in group collaborative structures and mainly as context providers. She argues that data and resource sharing are a common practice among artists that develop their work on the Internet, in which the emergence of meta-structures constitutes a byproduct of global culture that may include physical architectures, software interfaces such as browser technology, and art works that are meta-creations that in their open structures include the audience itself. To Vesna, these artists are interested in the creation of an aesthetic that goes beyond visual representation and is concerned with the invisible aspects that relate to the organization, access, extraction and navigation of information, through work in which the data constitutes the raw material to be shaped and used to build architectures of knowledge exchange and to actively comment on the context in which they operate.

From an artistic point of view, there is no shortage of issues to comment upon: according to Cook, Dietz & Kiendl (2005), databases are at the heart of society, they structure our economy, our knowledge systems, and our security, with an array of multiple and at times undisclosed agendas, that suggest access not just to information about the world, but also the world's access to information about us as the object of the database—our phone numbers, our credit card balances, our whereabouts.

Dietz (2000, 2007) quotes Hal Foster's (1996) questioning of a possible new dialectic of seeing allowed by electronic information, and if this archive without museum will be more than a base of data, and a repository of the given, to pose the question of if the access to information is in itself enough, asserting, however, that many contemporary artists use the database as their medium and as an aesthetic platform for their concepts, and not as merely as a container of metadata about them.

Paul (2008:175) states that the meaningfulness of data relies on its filtering in information by creating some sort of organizing structure similar to a visual or mental "map" that can allow for orientation, and although "static" methods for representing data, such as charting, graphing, and sorting—thoroughly discussed in Tufte (1990, 1997, 2001)—have been established over centuries, it is with the advent of digital technologies that 'information spaces' and the creation of visual models that

allow for the dynamic visualization of any kind of data-flow have become a broad field of experimentation and research, with contributions from Science, Statistics, Architecture, Design, Digital Art, or any combination of these. To Paul (ibid:177), the dynamic visualization of the data-flow brings the navigation of visual and textual information, and the experience of change over time to the users, and also allows for a multiplicity of possibilities regarding the visual output of any given set of data.

Paul describes the underlying concept and structure of most visualization projects in the Archive and the Database, which she claims as key elements in mapping and our understanding of digital culture. She states that during the 1990s, with the digitization of libraries, historical records and museum collections, data collection for commercial purposes, and the Internet as a gigantic data storage and retrieval system, archives and databases have become an essential form of cultural organization and memory, and that while as a repository of discreet units of data, in itself not necessarily meaningful and even in themselves a "dull affair", it is their relational power, expressed in the possibility of establishing multiple connections between different sets of data, and allowing for the construction of narratives about cultures, that makes their concept an underlying aspect of digital art (Paul 2008:185).

Referring to what distinguishes digital databases from their analogue predecessors, Paul states that its their inherent possibility for the retrieval and filtering of data in multiple ways, and that regarding the way in which data is stored and retrieved from its data containers, they can be distinguished according to different data models, the most common being: Hierarchical Databases, the ones that arrange data in hierarchies that are similar to tree structures with parent/child relationships; Network databases, close to the hierarchical model but establishing many-to-many relationships; Relational Databases, the most common form, and based on research by E.F. Codd at IBM in the late 1960s, they rely on the concept of tables—'relations'—that store all the data, are uniquely identified and as such can be called and found by the database, not requiring a close understanding of how exactly information within the database is structured; Client/Server Databases, allowing multiple 'clients' to remotely and simultaneously access and retrieve information from a database server around the clock; and Object-Oriented Databases, designed to work with object-oriented programming languages (such as Java and C++) and make object entries in

the database appear as programming language objects in one or more programming languages. She concludes by stating that, beyond the container, a database is essentially a system that comprises the hardware that stores the data, the software that allows for housing the data in its respective container and for retrieving, filtering, and changing it, and, of course, the users of the database, who add a further level in making sense of the data as information (Paul 2007:96).

Paul argues that the imposition of the logic of the database to any type of information, by filtering data collections, and visualizing data, brings forward to the discourse on digital art the term "Database Aesthetics", used to describe those aesthetic principles, and that according to Paul has become a catchword in the digital realm and a conceptual potential and cultural form for its promise to reveal visually, the patterns of knowledge, beliefs, and social behavior (Paul 2007:95). Paul further argues that the aesthetics of the database are inherently relational, and in itself they suggest the possibilities of tracing processes of multiple kinds, be they individual, cultural, or communicative, in various forms, and that the acknowledgement and understanding of the database as the foundation of any new media object configures a broad field of action that can include anything from a network such as the Internet, regarded as a gigantic database, to a specific dataset (Paul 2007:97).

Paul argues that the major role database aesthetics play in digital art and culture is due to digital media roots in the database structure, fostered by the 1990s digitization process, that allowed for new and straightforward possibilities in filtering and establishing relational connections, and even extending beyond the digital realm and transcending the traditional archives of the library and the museum, by constituting a shift toward a relational, networked approach to gathering and creating knowledge about cultural specificity (Paul 2007:109).

To Warren Sack (2006) the artists that at the beginning of the Twenty-first Century are working on projects that can be called "information visualization", face questions that go beyond the technically challenging issues of how data can be mapped and that concern the reason why textual or numerical data should be mapped into the visual. Sack argues that the particular question to be addressed regarding information visualization undertaken as artistic research, concerns the formulation of

an aesthetics of information visualization that asks about the critical, and artistic value of works in information visualization. The field's commitment to visual form appeals, according to Sack, to aesthetics as a field of inquiry in its role in examining issues of sensation and perception, and the understanding of why something is, or is regarded by someone as, emotionally, sensually moving, or beautiful, ugly, awe-inspiring, emotionally overwhelming, scary or comforting (Sack 2006).

Commenting on Manovich's notion of the "anti-sublime" in data visualization, Sack points out that the bulk of data visualization happens outside the art world, in computer science, medical and bio informatics, and that in a non-art context the "anti-sublime" defined as "that which can be easily understood" or also implying a "user friendly" or "easy" interface to huge amounts of data, are utilitarian criterions of science and engineering, a discourse of efficiency and beautiful image making that should be unsatisfactory for most artists and designers concerned with information visualization (Sack 2006).

The utilitarian discourse of efficiency is present in information visualization as a practice, Keith Andrews (2009) defines it as the visual presentation of abstract information spaces and structures to facilitate their rapid assimilation and understanding, taken advantage of human visual perception and our remarkable perceptual abilities to scan, recognize and recall images rapidly, to swiftly and automatically detect patterns and changes in size, color, shape, movement, or texture. Andrews adds that the essence of the visual commitment in information visualization relates to the offload of the cognitive work implied in text-based interfaces to the human visual perception system.

Shawn Allen (2010) gives a definition of data visualization that literally means the visual representation of quantitative data. He states that people with an interest in data triggered a need for its understanding through visual tools, and that visualization in turn became increasingly dynamic, leading to the creation of new tools for managing data. Furthermore, he adds that the costs for collecting analogue data through our own DIY sensor tools were driven down, and that countless other applications and software tools are springing up to help people collect, organize,

manipulate, visualize, and understand data from practically any source, turning Stalbaum's (2004a) vision of data exploration by communities closer to reality.

Allen quotes Michael Friendly's definition of "data" as information which has been abstracted in some schematic form, including attributes or variables for the units of information (Friendly & Denis 2001) adding that he prefers to go beyond the notion of data as an abstraction and rather think of it as an expression of occurrence, and that at Allen's Stamen studio, the preferred data to work is anything created by humans and that can range from: activity on social networking sites; geographical locations and categorizations of crime; health, education, and economic indicators for nations of the world, over time; financial transactions, often categorized by the type of goods or service they purchased—or grouped by day, month, or financial quarter when they relate to businesses; tons of CO_2 emitted by specific activities; people's aggregate activity, averaged by nation, etc.; and web site visits, typically grouped by time and date (Allen 2010).

Sara Diamond's (2010) defines data as comprising a set of organized measurements created by instruments that calibrate quantifiable qualities of an original source, be it natural, artificial, or recombinant, and as both an abstraction and mediation of actual phenomena. Diamond quotes Mitchell Whitelaw's (2007) description of data as a set of measurements extracted from the flux of the real, that are abstract, blank, and meaningless, and become information when placed in an interpretive context that requires the development of algorithms that allow for its selection, extraction, organization, analysis and presentation.

To Diamond, data visualization provides visual pleasure while offering possibilities of insight, understanding, and knowledge extraction on specific data contexts, and as such, and as a field of work, she argues that its aesthetic practices draw from art, design, computer and information science, and the sciences in general.

Diamond argues that visualization is contingent with a discourse that relates to utility and useful meaning, this logic is related to the data visualization strong connection to the real world, and its role as an assistant to fundamental discoveries and influence social policy and economics. However, she also adds that the notions

of objectivity that the entire process carries along might be strongly mediated by a plethora of what in research are called qualitative decisions—namely the prior decisions concerning a specific data set, the instruments chosen for the data collection, the structure of the database, source and sampling methods and software choices—turning the suggested accuracy into something that might be actually impossible to achieve.

Diamond's discussion of utility and beauty in data visualization argue against the segregation of both conceptions agreeing for instance with Vande Moere's argument for lush images, and his claim that the best works are those where aesthetics help people to understand the data, and where they almost tell a story. To Diamond, legibility, instrumentality and beauty need not to be discordant, and she finds unfortunate several positions that, in her words, legislate a separation between a teleological use-value and an aesthetic intrinsic one. She names as an example of segregational positions, Caroline Ziemkiewicz and Robert Kosara's (2008) differentiation between "pragmatic" Data Visualization—connected to efficient data reading—and "artistic" Data Visualization—using data in abstract or metaphorical ways, or Mitchell Whitelaw's (2007) argument that artists should not allow their Data Visualizations to become designs—an "aestheticized (and perhaps functionally impaired) form of scientific Data Visualization. Of course, these multiple perspectives have roots in the tension between traditional scientific belief in realism and objectivity and a more aesthetic approach connected to beauty and attractiveness, and as such, suggesting subjectivity and illegibility; in fact, Edward Tufte (2001) proposes that data visualizations are complex ideas communicated with clarity, precision and efficiency (Diamond 2010).

Artists' attraction for the database, and its materials' visualization, stems from similar aspects that attract other practitioners. Diamond mentions the excavation of hidden patterns and structures, the emergence of beauty, and at times, its reconnection with the social and political conditions of their production. These later two are more art-specific, though the impinge of data visualization on the social and political reality can serve a multiplicity of agendas. Diamond further suggests two distinct design approaches concerning an understanding of how to treat the data materials that play out in the making of visualizations. One, a data naturalist, structuralist

approach, bearing a truth to the materials, and puling out knowledge and narrative through inductive reasoning. Diamond states that this approach is argued by Tufte (2001, 2006) and his view of data stating their own structures. The other approach is based on Fry's (2008) proposal of a procedure that begins with narrative or story form and works its way back to the data, and in a way is very similar to question-driven research practice, in which the data set is considered and obtained in order to fit the question and its meaning. Diamond argues that this approach maintains the role of the scientist in theory production, illustrating, testing, and deducing while offering an opportunity for metaphor, design variation and the recognition of multiple interpretations of the same dataset by different disciplines (Diamond 2010).

Before commenting on artists' contributions to data visualization, Diamond also reflects on the interplay between the database practice of Data Visualization and aspects relating to cognitive science and context, and interactivity and immersion. She refers to Data Visualization and Cognitive Science's closely linked history, and points out a set of challenges and contributions in the application of cognitive science to data visualization. She refers to Colin Ware's (2004) proposition that Data Visualization is the scientific study of "distributed cognition", comparing pattern mechanisms in the human brain and the algorithms that map data to the computer, and in this way establishing a connection between human cognition, computer memory's algorithms and the physical actions of the user. Diamond acknowledges this matter's importance to successful design, but points out a lack in the understanding of human experience as differing from machine, and that Cognitive Science's focus on Data Visualizations primarily as utilities, emphasizes the study of aspects relating to speed and legibility rather than breakthrough discovery or the play of poetics and insight. Furthermore, she argues against the tendency of many Twentieth-Century Cognitive Scientists to universalize perception and cognition, referring to other strains in the field that suggest context and culture have an effect on perception. She draws on Varela, Thompson and Rosch's (1993:171) claim that because understandings are culturally learned, some categories, such as color perception, are not assumed to be objective, and in fact lead to subjective judgment, which according to Diamond (ibid), links perception and aesthetic categories.

On Interactivity and Immersion in Data Visualization, she quotes Bruno Latour's notion of a third space between subject, object and technology as the site of interactivity, intelligence and creativity (Burnett 2005:176), and understood as a part of a cognitive process of learning by doing, and engaging the body through navigation. On the various levels of interactivity that appeal to the public engagement in the experience of the works, she highlights Viégas & Wattenberg's Many Eyes project (2006) aimed at the popularization of data visualization and acting as a tool-kit for the public to build their own—in the process achieving three core uses of data visualization: to interpret textual data, to analyze complex objects and to use visualizations to initiate "social data exploration" (Danis et al. 2008 qtd. in Diamond 2010).

Diamond draws on Whitelaw's observation that Data Visualization is turning towards immersion and sensation, and emphasizing openness and intuition over the extraction of value and meaning (2007) to suggest the emergence of an aesthetic favoring highly interactive and immersive applications that engage body and mind, and that this practice signalizes an approach to rational analysis based on affective experience.

As an artist working form within the field, Diamond offers a characterization of artists' data visualizations as enhancing the visual literacy of the field, namely through their "precociousness" with language and context, their tendency to cross-disciplinary collaborations, and thorough training in aesthetics. She adds that Art's deconstructive tendencies are helpful in unfolding assumptions that are built into data collection and structure, and fulfilling the need for new tools that provoke insight in the fields where data visualizations are applied, and new evocative and provocative aesthetics that can be inferred from the experimental, abstract, multi-dimensional, and highly interactive works that constitute artists' database practices. She ends by highlighting the field's potential for the engagement of art and design practices in the discovery of new forms of expression and contribute to new realizations in the fields aligned with the corresponding data source. To Diamond, Data Visualizations are inherently indexical and, as such, tightly connected to its data source, that in its turn it is not a replacement for the Nature it represents.

According to Stalbaum (2004a), when considering artistic practices concerning the database, we must take into account two important notions regarding the ontology of data and information; one relates to the conflation of the terms "data" and "information", and the other concerns the previously referred notion of information disembodied from its subject.
According to Stalbaum, the idea of a generalized dissolution of physical materiality through digitization emphasizes the consequences of the disembodiment of data and information from its referent, whether relating to the human body and its disembodied 'data-body' or other manifestations of reality and the data which refers to it (Stalbaum 2004). Paul (2008:174), quoted in Stalbaum (2004a), states that in the digital age the concept of disembodiment extends beyond the physical body to general notions of the object and materiality, and that information itself seems to have lost its 'body', becoming an abstract 'quality' that is able to make fluid transitions between different states of materiality.

Stalbaum (2004a) reaffirms this notion of disembodiment—the abstraction of information from reality—referring, as previously stated, that in a way, information and data were always disembodied, and that the radical difference brought by the digital era relates mainly to the distributed nature of high-speed data processing, that motorizes, automates, and renders ubiquitous the potential of data and information to impinge on daily life. In this way, despite an actual disembodiment, it establishes a dynamic of influence between data/information and the material reality from which they derivate. This position, Stalbaum states (2004a), is supported by Paul Virillio's information theory as the third dimension of matter, in which it becomes a part of the real world projected directly over the body, a hyper-activated body by information machinery.

In a definition of information as the inferred conclusions extracted from the logic processing of a dataset, in which data are essentially raw facts from which information can be extracted, Stalbaum sets the fundamentals for an analysis of the contemporary creations regarding database-related art practices. He identifies, on one hand, an aesthetic strategy relating to the visualization of data that Manovich critiques, in The Anti-Sublime Ideal in Data Art (2002), as an unidimensional quest for beauty and information through the processing of large data sets into a visual

context; and on the other hand, a practice more directed towards the exploration of said data and their relation to the actual materials that are modeled by data, and seek for new exploratory methods for interacting with the material world that reveal new knowledge about those materials, about our interactions with them, and that allow the data to become a cooperative co-participant in the performance (Stalbaum 2004).

In order to interpret artistic practices regarding the database, Stalbaum outlines three practice modes; database politics, data visualization, and database formalism.

Stalbaum describes the first trend, database politics, as relating to the disembodiment of data and information, its abstraction from its referent and from the real, and its relationship with the body on its social and political dimensions. Database politics explore issues relating to the 'data body', a body of data that emanates (also) from the body, and constitutes what Haggerty & Ericson (2000) term 'data double', a virtual data body corresponding to the digital trace left by every physical body, resulting from an assemblage of surveillance devices whose ambition goes beyond the centralized control of Poster's Superpanoticon, into our constitution as consumers, the redefinition of the notions of privacy, and establishing the disappearing of disappearance (Haggerty & Ericson 2000).

Stalbaum's data visualization problematic was already discussed, and according to the last formalist tendency, he argues that its database conception as a virtual context for implementing a data co-operative mediation of the world, converges with database politics. To Stalbaum, although the formalist approach seems apolitical at first, its practice is similar to the database politics model in their mutual goal to realign the power of the database to distribute the real, and albeit from different reasons, opposing data visualization's dominant drive to better understand data.

To Stalbaum, database formalism, as a trend, reaffirms the virtual and its capacity to effectively impinge on the real, and allows aesthetic analysis to move toward and explore truly interesting, purely formal issues of the database itself as a medium. He adds that formalist database practice is conceptually in alignment with the pervasiveness of the database in our culture, and should perhaps encourage individuals to

develop expertise, even if for apolitical ends, that would produce ecologies of knowledge that would be equally useful in situations of political distress. He concludes stating that all the three models are important, and that they are not mutually exclusive, but certainly overlap in the actual practice.

Exploratory, Explorative, Exploration

The idea of an exploratory approach to the database and its central place in this study has roots in Stalbaum's (2004a) notion concerning the role of the database artists or practitioners, who, in his opinion, should play a central role as guides in data exploration more so than experts in data visualization. This differentiation of roles comes through upon Stalbaum's discussion of the cultural conflation of the definitions of the terms "beauty" and "sublime" which he parallels with a similar interchangeability happening with the terms "information" and "data". The article states that like information and data are sometimes interchangeable terms in common usage, (often taken to mean information), the meanings of beauty and sublime are similarly conflated, (often to mean beauty).

In order to establish a clear divide between terms, Stalbaum (2004a) states that beauty in data visualization is opposed to the sublime, beauty being the pursuit of clarity, balance and transparent form, similar to when data visualization is pursued for the sake of data clarity and understanding; and the sublime being the condition under which the data overwhelms its viewer, and the viewer's senses are mobilized in a special kind of cognition to which there are many names: intuition, anticipation, instinct, or a sixth sense. It means an important divide between facilitating the understanding of data through beauty, an inherent role of data visualization, and the access and processing of raw unmediated data by users and communities in an effort to take democratic control of their own data interpretation that the sublime analysis suggests. It is in this context that it is suggested that the important role that the artists may play in this regard, relates more to their capacity as guides in data exploration than as experts in data visualization.

Taking into account the formal definitions of "data" and "information", where the former, defined as raw facts are collected, mined and logically processed into the

conclusions or news of significant difference that constitute the later, Stalbaum draws a parallel with the issues raised by the notions of beauty and the sublime. He highlights the Data Visualization practice as bound to the transition of representations between states of being data and states of being information, further stating the pursuit of information as being the pursuit of the beautiful, and the pursuit of data as being the pursuit of the sublime, the former implying a struggle for understanding, the later an impulse for exploration, including the collection and generation of new data (Stalbaum 2004). From this perspective this study interprets Stalbaum's database exploration notion as a database practice that goes beyond the understanding of information as a simple output of data and its commitment to visual form, and hinting at an exploratory approach that includes the collection and the generation of new data.

Stalbaum (2004b:2) makes a case for the artistic exploration of data quoting Moore's Law prediction of the processing speed doubling every 18 months and its matching or even exceeding by the exponential data available to be processed. He states that the relationship between humankind's ability to collect, to process and understand data is co-exponential and that the problem of big data, in spite of Gordon Moore's law, optical networks, and cheap mass storage, soars larger as the ability to collect data competes with its processing. Data looms from every corner of human activity in quantities that challenge the limits of computation, especially from areas of scientific research that produce large data sets such as genomics, astrophysics, geography, geology, particle physics, climatology, meteorology, nanotechnology, materials science or even the search for extra-terrestrial intelligence.

After the fact of data increasing ubiquity and abundance, Stalbaum implies the nominal if not tacit assumption of computation within contemporary art practice in light of its pervasive implementation along with communication technologies in every aspect of the emerging global culture. He goes on to challenge this new generation of computer literate artists by problematizing a set of questions that might be relevant in the presented framework, namely the big data impact on artists working in a rich computational environment, the emerging aesthetic and conceptual parameters for artists recognizing coding and data as the primary expressions of an art practice pushing the envelope in the realms of the artist-audience equation, and

finally the realization that the environment we live in exposed to a constant stream wash of data, will pose many other important questions, particularly the ones relating to the artists' role in interpreting both cultural and scientific phenomena, that Stalbaum (2004a) deems as exploratory.

Manovich's (2002) understanding of data immersion as a fundamental new dimension in the art's portrayal of human subjectivity, echos the Romantic artists' thought of certain phenomena as un-representable and beyond the limits of human senses, and stands for as his critique of an aesthetic approach to big data that is described as anti-sublime for its aim at reducing the unattainable and un-representable to a representation whose scale is comparable to the scales of human perception and cognition.

Fig. 1: The Wreck of Hope (Friedrich 1823-24).

Caspar David Friedrich's *The Polar Sea* painting bears some similarities to a synthetic 3D computer rendering of a multi-planar surface disaster; in fact, the painting portrays a shipwreck and is also known as *The Wreck of Hope* in reference to an early North Pole Expedition.

The nineteenth century painting was used in an article and a talk by artist Lisa Jevbratt (2004a), author of 1:1 and other projects to be discussed as part of this study's data, her talk was titled: A Prospect of the Sublime in Data Visualizations.

Jevbratt made use of the painting to illustrate a classic romantic idea of the sublime. This image, portraying the inhospitable, the explorers' will to reach the unreachable and do the impossible, the attraction for the void, as Jevbratt puts it, a driving force to look out and up and a direct reflection of the way we contemporarily also look down and in, through all sorts of technological probing, whether directed at the world we live in, the structures we create and build, or to our own bodies. She claims that the datasets and sensations we have to deal with are of no less dimension, vastness and grandeur than the ones that were subject of the classical sublime and romantic artists had to face, and makes the case for esthetic decision-making by borrowing Jack Burnham's Systems Esthetics (1968) notion that when facing highly complex systems and the impossibility of making "rational" decisions within them, we understand them by making more intuitive "aesthetic decisions". Jevbratt then parallels Burnham's aesthetic decision idea, a concept he had borrowed from economist J.K. Galbraith, with Emmanuel Kant's reasoning about the mobilizing effect of the sublime that must have inspired every romantic explorer to roam the earth's most inhospitable corners. Jevbratt states Kant's claim that in experiencing the sublime, as when facing large amounts of information, huge distances and ungraspable quantities, rather than feeling overwhelmed, we feel empowered and capable, our senses and organizing abilities mobilized.

Lisa Jevbratt makes a case for Kant's overwhelming sublime as an activating sensation where the huge and ungraspable can motivate intuitive understandings of the data and points out that the most common mistake in the scientific or artistic visualization of data, is not too much information but too little (Jevbratt 2004a:7).

In order to benefit from the remarkable human perceptual abilities linked to visual perception (Andrews 2009:4), the commitment of large quantities of abstract information to visual representation when related to statistical graphics and data visualization, is not a modern development in statistics as it is common to think (Friendly 2008:16). As expected, Friendly (2008) states that the deep roots of graphic portrayal of quantitative information reach the early histories of map-making and visual depiction, evolving through thematic cartography, statistics and statistical graphics applied and linked to innovations in medicine and science, connected to the rise in statistical thinking and widespread collection of data for planning and commerce

up through the 19th century. The reaching of the current state of widespread use of data visualization that we are now witnessing in the first decade of the 21st century, was impelled by a conjunction of technological advancements spanning from drawing to image reproduction, from mathematics and statistics through data collection, empirical observation and recording (Friendly 2008:16).

The intellectual history of the commitment of data to visual form from medieval to modern times comprised in the Milestones Project (Friendly & Denis 2001) provides a comprehensive overview of the developments in a variety of fields related to the history of data visualization and its advances, furthermore highlighting its many historical accounts and providing a panoramic understanding of data visualization through the collation of contributions of disparate disciplines, and attempting to map the entire development of visual thinking and visual representation through the intertwining of the many discipline's particular histories (Friendly 2008:17). The Historical accounts of developments that Friendly (2008) lists span from contributions by Hald (1990) in the field of probability, by Pearson (1978), Porter (1986), and Stigler (1986) in statistics, by Riddell (1980) in astronomy, and by Wallis and Robinson (1987) in cartography that provided contributions and important developments to modern data visualization; specialized accounts by Hoff and Geddes (1959, 1962) focusing on the early history of graphic recording, by Funkhouser (1936, 1937), Royston (1970), and Tilling (1975) in statistical graphs, by Farebrother (1999) in fitting equations to empirical data, by Klein (1997) in economics and time-series graphs, Friis (1974) and Kruskal (1977) in cartography, Robinson (1982) and Palsky (1996) in thematic mapping and statistical thinking, Wainer and Velleman (2001) in a recent account of the history of statistical graphics. Friendly argues that notwithstanding the variety of the work listed is through its interweaving that a general understanding of visual thinking and the visual representation of data across the centuries can be accomplished.

Through the Milestones Project, Friendly and Denis approach the history of data visualization in the larger picture and around the significance of every milestone and its resonance in past and present contexts. They raise questions about the motivations behind every development, their communication goals, the relation to other developments, idea precursors and its re-invention in today's work. Reflecting on the

milestones, for instance the 17th century's concern with physical measurement of time, distance, and space, and the beginning of the systematic collection and study of social data in Europe, Friendly states that the earliest seeds of visual commitment of data arose in geometric diagrams, in tables of the position of starts and other celestial bodies, and in the making of maps to aid in navigation and exploration (Friendly 2006).

The Re-birth of Data Visualization that the Milestones Project (Friendly & Denis 2001) dates in the period between 1950 and 1974, and describes as a rise from a previous dormancy era under the influence of the formal numerical quantitative *zeitgeist*—with only a few graphical innovations and termed the Modern Dark Ages of visualization (1900-1949)—is spurred by three significant developments. One of them is John Wilder Tukey's landmark paper The Future of Data Analysis (1962), where he issues a call for the recognition of data analysis as a legitimate branch of statistics, and even more relevant to this study, the establishment of Exploratory Data Analysis (EDA) (Tukey 1977), the related invention of a wide variety of new, simple and effective graphic displays, and his informal graphical approach to data analysis.

The Exploratory Data Analysis approach is described in its website precisely as an approach, attitude of philosophy about how data analysis should be carried out, and not merely as a set of techniques. The underlying philosophy relates to how data is dissected, what is looked for, and how is the looking and interpretation done, allowing the data to reveal its underlying model and structure. It is stated that almost all EDA techniques are graphical in nature with few quantitative complementing techniques, and that the reason for the heavy reliance on graphics lays in EDA's main role and nature to open-mindedly explore.

Tukey's reputation as a statistician whose approach to exploratory database analysis restates the basis to a visual relationship with complex datasets confirms and further defines the exploratory approach in database related practices. In his We Need Both Exploratory and Confirmatory article (1980:23), he states that we often forget how science and engineering function, its ideas coming from previous exploration more often than from lightning strokes. He reaffirms exploratory data analysis as an at-

titude, a flexibility, and a reliance on display, and that no catalogue of techniques can convey a willingness to look for what can be seen, whether or not anticipated, as the heart of exploratory data analysis (Tukey 1980:24).

Unwin, Chen & Härdle (2008:4-5) acknowledge graphics extensive use in statistics since many years. On their introduction on graphics for data visualization they state that although they provide an excellent approach for exploring data (thus being essential for presenting results), the body of theory produced on the topic is not substantial, even after the significant attention paid to graphics for presentation due to Edward Tufte's contributions, and mainly expressed as a set of principles to be followed, rather than formal theories.

They establish two fundamental differences in both form and practice relating to what they call graphics for presentation and graphics for exploration. Unlike presentation graphics, that they define as static, high quality, and like single proofs of mathematical theorems, the exploratory ones are used for looking for results, they are used in quantity, and they are fast and informative rather than slow and precise. Unwin, Chen & Härdle, in the line of Tukey's exploratory data analysis, present exploration, connected to the use of visual graphics, as an informal but crucial step in data investigation, as a process of discovery but nevertheless, as a path or mean to achieve a specific and different more definitive end. They state that while a presentation graphic will be drawn for viewing by potentially thousands of readers, thousands of exploratory graphics may be drawn to support the data investigations of one analyst.

Writing about the benefits of using multiple linked views as a concept for the visual exploration of data, Adalbert Wilhelm states that the easiness, speed and flexibility by which these close connections between plots that show different aspects of related data reveal, are essential features in the exploratory stage of data analysis (Unwin, Chen & Härdle 2008:200-214).

To further define the notion of exploratory, the study borrows from Daniel Fallman's (2008) model on interaction design research, presented in his paper *The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Ex-*

ploration, that evolved at the *Umeå Institute of Design, Umeå University,* in Sweden, and guides their interaction design research efforts as well as their Ph.D education.

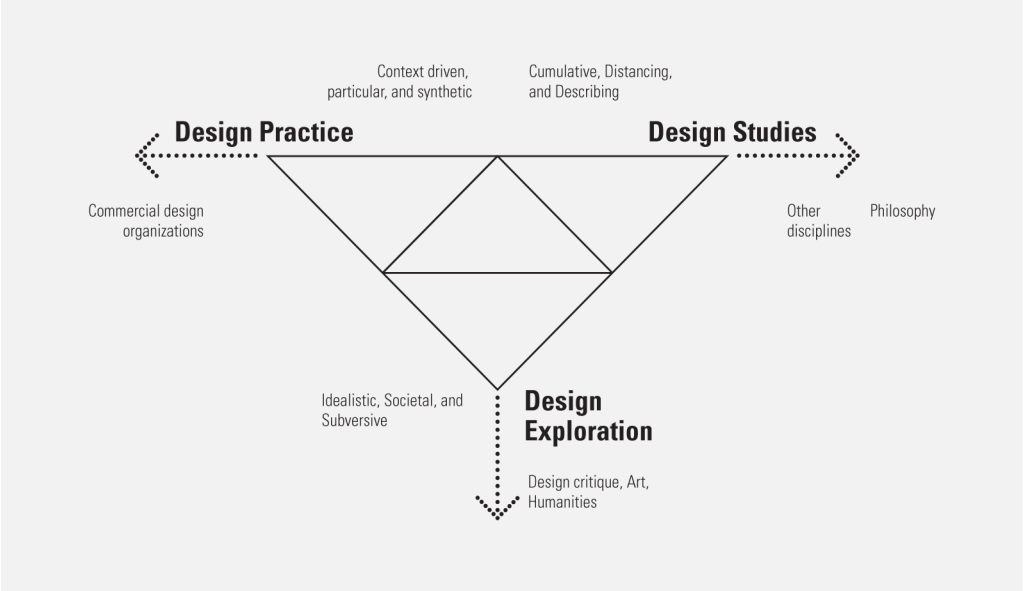

Fig. 2: Fallman's Model of Interaction Design Research (Fallman 2008:5).

Fallman states that the model, as a framework for thinking about interaction design research, has provided guidance in keeping up in what they consider three vital external interfaces: with industry, through long-term collaborations and human resources exchange, academia, by fostering vital research networks among students at the design school, and finally the interface with society at large, connected to design exploration, and about which he states as fostering the thinking about interaction design research as having a voice in societal discussions, and particularly in exploring and shaping possible futures (Fallman 2008:4).

Fallman & Stolterman (2010:265) state that their primary contribution is to be understood as three different design research activities—design practice, design studies and design exploration—with their own purposes, intended outcomes, and internal logic. Fallman's model is shaped as a triangle presenting a two-dimensional space for plotting the position of a specific design research activity in a possible space between the three extremes: "design practice", the industry link, "design studies", the academic link, and "design exploration", the society and speculative link (Fallman 2008:5).

As a key concept of the model, Fallman & Stolterman (2010:269) point out that the actual methods, techniques and tools used in the different activity areas can be quite similar, and that they are primarily different in perspective, purpose and tradition.

Fallman further describes the three branches in detail, namely through inter-related concepts differentiation in a section he calls dimensions and presents as a conceptual subset connecting and creating a one-or-two-dimensional continuum between areas of activity and giving meaning by creating tension between those different activity areas (Fallman 2008:11), it is also in this section that the opportunity for the exploratory categories extraction is better devised and there will be a detailed focus in these aspects later in the study.

Concentrating the study's attention in the design exploration extreme of the model, that Fallman terms as Design Exploration (2008:7), or Research as design explorations or Explorative Design (Fallman & Stolterman 2010:268-269), and describes as seemingly similar to design practice, being synthetic and proactive to its character in that the interaction design researcher is typically involved in bringing forth an artifact of some kind, rather than considering the users' needs, client demands or market opportunities, design exploration extensively uses theories, ideals, technology and other alternative foundations for design (Fallman & Stolterman 2010:269).

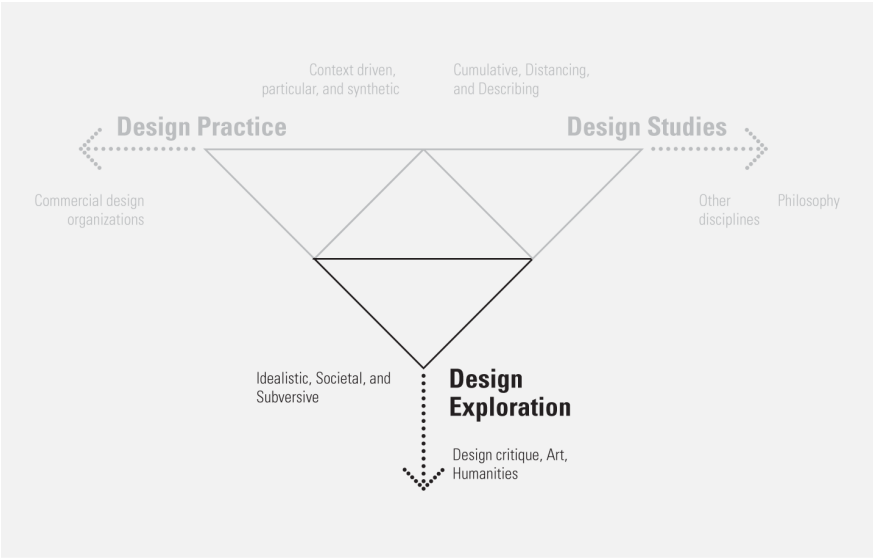

Fig. 3: Design Exploration's branch detail (Fallman 2008:5).

According to Fallman (2008) and Fallman & Stolterman (2010) Design exploration focuses on testing ideas and asking questions through design such as "What if?" possibilities, excelling at what Donald Schön (1992) calls "problem-setting" and Ehn (1998) refers to as "transcendence", as an exploration of possibilities outside the current paradigms of style, use, technology or economical boundaries (Fallman 2008:7). But, also aiming at provoking, criticizing, and experiment in order to reveal alternatives to the expected or the traditional, aspiring, as noted, to transcend accepted paradigms and bring matters to the forefront (Fallman & Stolterman 2010:269).

A further typification of design exploration by Fallman (2008)—understood as "critical design", highlights the fact that the typical client in this activity area is the researcher's own agenda, the projects typically being self-initiated, using design to critically comment on the relationship between technology and society, business, and particular user groups and science, rather than pursuing commercial objectives. Design is used to indicate the possible, desirable, ideal, or simply what is different from mainstream viewpoints. Its expression is often societal, showing alternatives and examples. It is a way to comment on a societal or cultural phenomena, through stand-alone artifacts that make statements, offer arguments, or in other ways contribute to ongoing societal discussions or shed light on certain circumstances or events. The design methods are described as dialectical and interpretive, often being influenced by or entirely driven by hypothesis or theory. Fallman states that this is especially evident in critical design, referred to as an extreme form of design exploration, in which the design researchers knowingly aim at stating a subjective standpoint or a design direction they see as desirable.

Fallman mentions Anthony Dune and Fiona Raby's work as Dunne & Raby, which he terms techno-critical digital art, as a paradigmatic example of design exploration, particularly in its deliberateness to provoke and criticize a current state of affairs. Curiously Dunne & Raby (2007) list the belief of critical design as being regarded as Art as one of its biggest misconceptions, and state that in spite of borrowing heavily from art in terms of methods and approaches, it is definitely not Art. They add that while we expect art to be shocking and extreme, and in that way easy to deal

with, critical design needs to remain closer to the everyday, because that's where its power to disturb comes from, that's where it suggests how things could be different, that things could change (Dunne & Raby 2007).

Fallman (2008:8) sums up design exploration highlighting its intent to test ideas and ask questions about possibilities—the "What if?" questions—in conjunction with an aim to provoke, criticize, and experiment to reveal alternatives to the expected or the traditional, transcending accepted paradigms, bringing matters to a head, being proactive and societal in its expression, driven by ideals or theory, providing a necessary space for aesthetic concerns, producing artifacts of a societal or even subversive character. Fallman & Stolterman (2010:270) add that this form of design research is shaped by an ambition to explore new solutions, new directions, new technology and new usage, to broaden the overall design space or to rock the boat, without necessarily solve existing and well-defined problems. Further in the article, discussing notions of rigor in design exploration, the authors point out that an important criterion in said rigor is to what extent the design researcher is able to continue to 'problem-set' rather that 'problem-solve', and further state that the process of design exploration should open-up a critical and creative approach that challenges mainstream assumptions in design, such as the consumer perspective, technology, tools and usability.

In its triangular model of design practice, design studies, and design exploration, Fallman (2008:10) acknowledges that the most interesting and rewarding results in interaction design research come from moving in-between the different extremes of the model across the defined activity areas, and claiming that they are primarily different in terms of perspective and tradition.

It is in the dimensions sub-section of the discussion of moving in-between the three activity areas, that Fallman further elaborates on the tensions of moving across the model, and defines dimensions as a conceptual sub-set within the model creating an inter-dimensional continuum across activities. Fallman's dimensions, whether described as arising from the model, adopted directly from design theory literature, developed from perceived differences in world-views among designers and research-

ers, and the author's own experience in practice, research, and teaching, are summarized as an example of the model's potential to generate discussion.

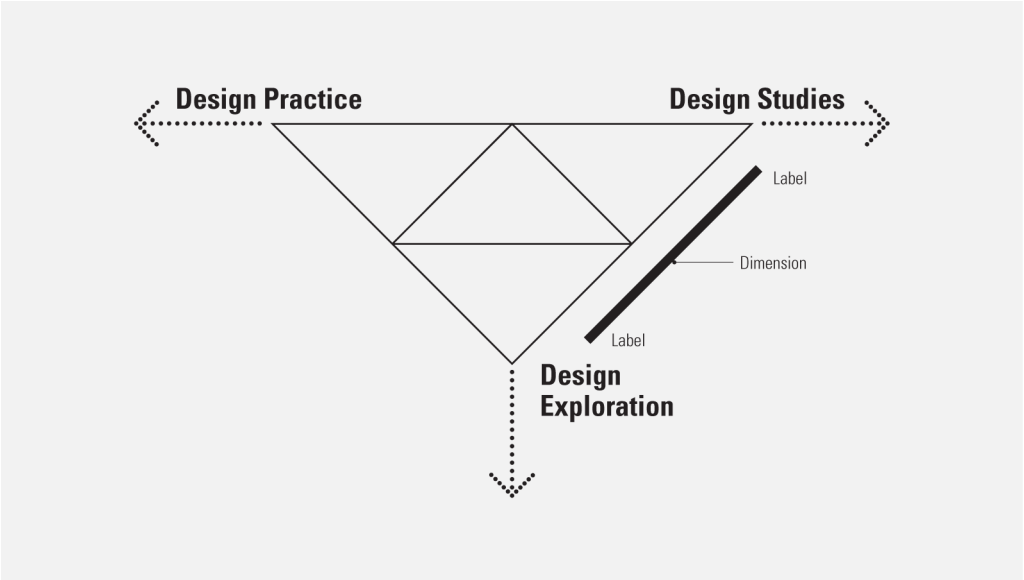

Fig. 4: Model Dimensions (Fallman 2008-10).

The dimensions across the model, when concerning design exploration, are presented, described and detailed by Fallman (2008:13) as follows:

The tension in between the True—Real—Possible, in which design practice needs to be concerned with the real, creating real products for real needs in the real world; design studies need to be concerned with what is true, as within the intellectual tradition of building step-by-step foundational cumulative knowledge (Fallman & Stolterman 2010:270); and design exploration quest for what is possible, to show alternative futures, and transcend current paradigms.

The tension between Tradition—Transcendence, placing the emphasis on building-upon, extending or improving existing products or ways of thinking and working, rooting one's activity in an existing tradition, or exploring possible futures by transcending, understood as breaking down or going beyond, the boundaries of the existing paradigm.

The tension between the Particular—Universal—Ideal, design practice dealing with extreme specificity, requirements and constraints to produce a particular product or service; design studies concern with the general and the universal appropriate to sound academic work; and design exploration concern with the ideal, asking questions such as—what qualities should an ideal product or service embody?

The tension across the dimension Create/Change—Explain/Understand—Suggest/Provoke, in which creating and changing are the goals design practice strives for; understanding, explaining and predicting are the aims of design studies; and design exploration—whose basis is transcendence—often aims to suggest alternatives, problematize, criticize the current state of affairs, and of course, to provoke.

Finally, validity and quality concerns in the tension in between Client—Peers—Critics, design practice emphasizing the role of the client and business goals in its process; design studies relying on peers to guarantee good quality; and design exploration striving yet to find an accurate critical arena, Fallman & Stolterman (2010:271) stating that it is evident that a piece of techno-critical art cannot be assessed using the same criteria as those that establish the relevance in design practice, because in this context, the authors claim, rather than placing its relevance on clients, markets or organizations, it is tied to the impact the results will and can have on society on a more general sense.

A sum of characteristics from the Design Exploration axis in Fallman, arising from the tensions between the different dimensions between the three model activities are as follows: Design Exploration seeks the Possible, to show Alternatives, Ideals, to Transcend, to Provoke, to Experiment; its concerns are Aesthetics, it is Proactive, its outcomes are Societal, "Now"-oriented, its validity is through Critique, its role is, or can be, Political. Design Exploration can then be described as Idealistic, Societal, and Subversive and relating to Design critique, Art, and Humanities.

Fallman (2008:18) concludes by claiming that while design practice provides an interface towards industry, and design studies towards academia, design exploration does so towards society at large. He states that it appears to be an inherent power in the materialization of personal ideas, sketches, and thought experiments happen-

ing through design exploration, and that regardless of their outcome turning out to be products, services or spaces, this phenomena is able to establish communication channels that go beyond academia and industry, to become a voice in societal discussions and thus have a key role in shaping the future.

Our literature review articulated the two main areas of inquiry at play in our research. The work in the field, our primary motivation for this project, is as diverse and cross-disciplinary as its practitioners' discipline affiliations and backgrounds. We found useful to survey the field's production through their focus on data as their common source material, and while their expression and technological approaches may vary, they all rely on data and a dynamic approach to data containers, such as the database. We found fruitful to understand the database entanglement with culture and society by mapping its historical implications across pre and post-electronic theories of information, and its philosophical, ethical and political dimensions regarding fundamental issues such as privacy, control, and consumption.

The literature review reveals us the database as an interesting setting for artistic exploration, and exploration itself as an approach and philosophy inherent to data practices. That notion led us to borrow contributions to the definition of exploration in the context of database-related practices. We focussed our literature review on the establishment of a provisional categorization of aspects and traits to be correlated in the analysis of the data collected in the context of our study. Our methods and procedures pertaining the research design of our project is thoroughly explained in the following section.

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Design

What is the Nature of Exploration in Database Art Practices? The question that drives the present study is of a descriptive type, its aim is primarily to identify, describe and explore the specificity of said practices to find out the role and the characteristics of exploration in said context. The study's design concern, as Trochim (2006) asserts, is to describe what is going on and what exists, it is designed to explore thoroughly the identified context to formulate tentative hypotheses. Even if its exploratory and open-ended nature heads to an inductive logic approach, the study has nevertheless established an a priori theoretical framework. Such structure suggests hypotheses (Kellehear 1993), even if of an informal type (Trochim 2006), of what exploratory aspects are, and what evidence can be found in the data to support them.

Trochim (2006) also states that in social research, both inductive and deductive reasoning are essencial, and the present study evolves from this same underlying core. This author refers to a single deductive/inductive circular graph, continuously cycling from theories down to observations and up again to theories, and this fluctuation was consciously implemented throughout the whole investigation. Finally, the same author points out that even in the most constrained experiments, the patterns observed in the data may lead the researchers to develop new theories. The statement overtly implies that the capacity to deal with the data in order to articulate an original approach to it, overlaps the preoccupation of gathering and listing more data, with no critical advance.

Data

The ammount of data identified for the study comprise a total of 216 individual artifacts in database-related practices. These are believed to be in good alignment with the study's question and consequently capable to provide answers to the research main question.

The study acknowledges the notion that the generalization of the findings is the driving concept that motivates sampling, although its main concern is not universal generalization, opting for the richness of detail (Trochim 2006), illumination, understanding, and extrapolation to similar situations (Hoepfl 1997) that qualitative research implies.

Moreover, the steps taken to obtain the study's samples are in accordance to Trochim's (2006) scheme, beginning with the identification of the theoretical and accessible populations, following by the establishing of a sampling frame, and the establishment of the final sample comprised in the study.

The study's option towards the definition of a unit of analysis favored the *Nonprobabilistic Purposive Sampling*. Purposeful sampling is the dominant strategy in qualitative research, seeking information-rich cases or contexts that can be studied in depth (Patton 1990 qtd. *in* Hoepfl 1997). *Nonprobability Sampling* does not involve a random selection; it cannot depend upon the rationale of probability theory, and, as such, is a cause of concern to external validity, particularly when it comes to the rigorous and accurate representation of the population to whom the sample is supposed to generalize to (Trochim 2006). However, as generalization is not the ruling concern of the qualitative descriptive nature of this research, the option was to take advantage of the flexibility of purposeful sampling. The study proceeded to the nonprobabilistic identification of a large corpus of work that emerged from the literature, which is constituted of 100 artifacts from a multiplicity of authors sampled from the total identified data with a specific purpose in mind.

The Purposive Sampling method aimed for diversity and, consequently, an *heterogeneity sampling* emerged as a subcategory. The aim was to be inclusive and to identify

as much artifacts as possible under the guise of what emerged as a database-related practice. As stated above, the artifacts included in the sampling emerged from the literature but were also found in related contexts. Some identified objects pointed to related work in a process similar to *snowball sampling* (Trochim 2006).

Lee (2000) points out that in Information Science the growth of the *World Wide Web* brought a new interest upon how researchers perform their activities, namely about the possibility of treating its online repositories as field sites, under the field research logic and sampling strategies. Lee's point of view draws on procedures supported by Helmericks et al., in which is stated "…documentary sources might be regarded as research 'sites', and their producers as 'informants'. Using personal knowledge, knowledgeable others and published guides, procedures analogous to snowball sampling can be put in train, when no more likely sites are generated, sampling stops." (Lee 2000:14)

The 100 sampling units that constitute the data of this study range from *Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 through August 8, 1971,* a project by Hans Haacke, from 1971, part of the exhibition *Database Imaginary,* 2004-2005, co-curated by Sarah Cook, Steve Dietz and Anthony Kiendl at the *Walter Phillips Gallery, The Banff Centre,* in Alberta, Canada, to four artifacts from 2009 that are thirty-eight years older, such as *Portrait (Rembrandt)*, by Jason Salavon, *The Weather Bracelet,* by Mitchell Whitelaw, *Perpetual Storytelling Apparatus,* by Julius von Bismarck and Benjamin Maus, and *Social Collider,* by Karsten Schmidt and Sacha Pohflepp.

The study's unit of analysis was extracted from the already mentioned global sample of 216 individual artifacts collected through references in the study's literature and associated contexts. From the 100 sampling units chosen, 57 were identified through a process that, in a first instance, privileged work presented in the following six exhibitions which were held over a time span of six years: *Ars Electronica 1998 INFOWAR Information.Macht.Krieg,* curated by Gerfried Stocker; *Data Dynamics,* 2001, and *The Whitney Biennial 2002 Net Art Selection*, both curated by Christiane Paul at *The Whitney Museum; All Star Data Mappers,* 2002, curated by John Tonkin; *From Wunderkammer to Meta-Data - Data Knitting,* at the *Dutch Electronic Arts Festival*

in 2003; and *Database Imaginary* at the *BANFF* in 2004. The *Decode: Digital Design Sensations,* 2009-2010, exhibition at the *Victoria & Albert Museum,* contributes with 3 additional artifacts to the data collection list. The remaining fourty artifacts relate to the already referred ones, to their authors, and to the study's literature.

What follows is a detailed data description of the unit of analysis' 100 samples that uses the artifacts' own literature, often collected from their entries on the cited events or their individual Websites. Whenever possible this information is complemented with additional bibliographic sources, which are relevant to the study and contribute to further consolidate each project as part of the assumed database-related practices. The narrative sequence is organic and surfaced both from the process of identification of the units among the cited events and the parallel connections, that allowed for the inclusion of related artifacts by the same authors or from the quoted literature.

Although the study's data sample comprises artifacts prior to 1998, the study's description of the sampled data will start by listing two artifacts from the *Ars Electronica Infowar* edition from that same year. The *Ars Electronica* archive states that its 1998 edition focuses on the impact that computer technologies have in a world that is increasingly shaped by information and Networks. That source also shows that the *Ars* commitment to the examination of social and political issues is continued by the 1998s' *INFOWAR* theme, as its focus lays on data-supported wars. Starting from the notion of war as the "father of all things", the introductory text adds that *INFOWAR* assesses its connection with the internal logic of the Information Society and clarifies the strategies and possibilities of computer-supported conflicts such as the Gulf War or the activities of cyberguerillas.

Christina Teuthorn (1999) states that computer screens are the modern battlefields, and that knowledge, information, and data, are the future soldiers' deadly ammunition. Computer viruses and worms, trojan horses, logic bombs or nano machines are stored inside their motherboards and ready to be launched as deadly weapons at a mouse click by a panoply of Info War protagonists that range from cyberwarriors to web-terrorists and warbots.

Stocker & Schöpf (1998) add to the discussion by speaking of a revolution in military affairs that makes itself evident through the mutation of war into the bloodshed-free discreet actions made in the cyberspace and the infosphere by the protagonists and propagandists of information warfare. These authors also let us know that the *INFOWAR* project enables them to understand the social implications of the digital revolution, particularly the articulation of the reality of war and warfare, with the suitability of the immaterial sphere as an improved battlefield (Stocker & Schöpf 1998).

From the projects presented at the *Ars Electronica INFOWAR* edition, the study lists two artifacts that explicitly make a dynamic use of data mapping in their design; *(Two Line) Orbital Elements,* by Dietmar Offenhuber, 1998, and Marko Peljham's *SOLAR,* 1998.

Fig. 5: (Two Line) Orbital Elements (Offenhuber 1998).

Offenhuber's *(Two Line) Orbital Elements* is described in the Festival's catalogue as the romanticism for data fanciers and ham (amateur) radio fans. The project makes tangible to the user the invisible motion of two earth observation satellites, the *NOAA 14* and *meter 3-5,* one Russian and one American, through the use of a live-transmission from their on-board cameras. The calculation of a simulation extracted

from the orbital data, provides for an acoustic mapping overview of the activities taking place. The project technical basis derives from *WXSAT,* a public-domain software program by Christian H. Bock, that enables the satellites' radio signals to be demodulated using a low-cost sound-card, and from *STSPLUS,* a *PD (Pure Data)* program by David H. Ranson used to track satellites.

Fig. 6: Solar (Peljham 1998).

Marko Peljham's *SOLAR* performance is described in the Festival's literature as a research output of the *Makrolab,* a project that dealt with the direct interception and mapping of telecommunications in the whole electromagnetic spectrum. *SOLAR* is integrated in a project series designated *Wardenclyffe,* and part of a collaboration between artists and engineers of *Projekt Atol/PACT Systems* and German Music Label, *Rastermusic/Noton. SOLAR,* was dedicated to the memory of Nicola Tesla and his work in the experimental station for "world telegraphy" located in Wardenclyffe, Long Island (New York). *SOLAR's* core is an Electro Magnetic transmitting engine and real-time system that receives, processes, records, produces and retransmits analogue and digital signals present in the spectrum.

The *Database Imaginary* exhibition at *Banff Centre,* which includes Hans Haacke's *Visitors' Profile…* from 1971, the oldest sample unit in the study, contributes with its 24 projects for the study's data database. On the exhibition presentation text and in its overview we may read that "Databases drive culture" and that the exhibition "explores artwork and emerging cultural forms by artists who use databases to comment on their uses and to imagine unknown uses." The text also informs that "the term database was only coined in the 1970s with the rise of automated office procedures, but the 23 (sic) projects included in the exhibition … deploy databases in imaginative ways to comment on the everyday life in the 21st century" and that "using newly inflected forms of visual display arising from computerized databases, the works seem to raise questions about authorship, agency, audience participation, control and identity." (Cook, Dietz & Kiendl 2004)

From the exhibition's introduction text we learn that the featured projects were created between 1971 and 2004, a span of time almost coincident with the use of the word database. Of course that it was only with the rise of computing and widespread access to vast quantities of organized information that the term as come to the fore in the popular imagination.
Besides these circumstances, and as the study has shown in the previous section, the urge to organize is a longstanding trait in human civilization. Therefore, the *Database Imaginary* project is less about databases than about the cultural moment when they become ever-present (Cook, Dietz & Kiendl 2004). It is indeed this cultural moment of the database awareness and some of the work spanning from its collateral issues that constitute the main focus of this study's sampling.

Haacke's *Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 through August 8, 1971,* is part of the artist's *Real Time System* series that according to Edward Shanken (2002) are inspired by conversations with Jack Burnham and his concept of "real time" with respect to art. Time is differentiated from "ideal time", in which aesthetic contemplation of beauty takes place in a theoretical isolation from the temporal contingencies of value. Time then results from the basis of an immediate, interactive, and necessarily contingent exchange of information (Shanken 2002:435).

Visitors' Profile is in tune with Haacke's definition of his art as an analysis and a reflection on social structures, conjugating demographic questions with current, social and political ones. Since the late nineteen-sixties Haacke carried out a series of polls to the visitors of his exhibitions. *Visitors' Profile* (1971), compiled during the exhibition *Directions 3: Eight Artists at the Milwaukee Art Center,* was the first time that the answers to the questionnaire were processed by a computer allowing the real-time display of the feedback loop between the audience and the artwork.

Fig. 7: Visitors' Profile… (Haacke 1971).

Initially, the computerized version of *Visitors' Profile* was planned for Jack Burnham's *Software* exhibition at the *Jewish Museum* in 1970 in which the computer assisted piece would calculate the statistical data in real time, so the system would responsively gather and evaluate information about the systematic relationship between art and society (Shanken 2002:435). Due to equipment failure the computerized version of the poll did not operate at the Software exhibition and was later put into practice at the *Milwaukee Art Centre*.

Other contributions from the *Database Imaginary* show include the pioneering web based piece *The File Room,* by Antoni Muntadas, an ongoing project initiated in 1994, and originally produced by *Randolph Street Gallery* with the support of the *School of Art and Design* and the *Electronic Visualization Laboratory* at the *University of Illinois* in Chicago. On the project description we can read that *The File Room* is an online database and the re-creation of a historic installation first exhibited in 1994 at *Randolph St. Gallery,* consisting of a room of file cabinets, a table and computer stations in which visitors can browse and contribute to the online *File Room* — an open and updatable catalogue of instances of censorship.

Fig. 8: The File Room (Muntadas 1994).

The File Room is referred by Steve Dietz (2007) as pointing to a very different model-of bi-directional information flows, multi-nodal information sources, collaborative filtering, multiple points of view, the transgression of geographic and discipline boundaries, and the commingling of specialist and non-specialist; by Victoria Vesna (2000) as devoted to documenting cases of censorship that are frequently not available at all or else exist somewhere as dormant data, while Rudolf Frieling (2004)

regards it as responding to the connection between exclusion and (art-)political censorship by collecting cases of censorship from all over the world via the Internet, subsequently making them available to anyone as a collection of documents there, and as emerging as a counter-archive to the postulated official writing of history.

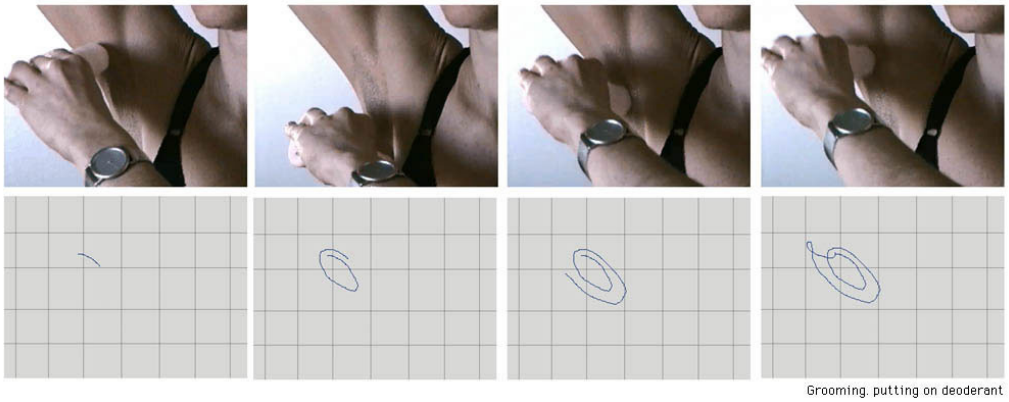

Fig. 9: Databank of the Everyday (Bookchin 1996)

Natalie Bookchin's *Databank of the Everyday,* 1996, a CD-ROM encyclopedia of the quotidian modeled after commercial image databases, categorizes daily activities into headings such as 'wasting time', 'nervous habits' and 'antonyms' (Cook, Dietz & Kiendl 2004). It takes as its subject the real daily uses of computers in our culture: storage, transmission, dissemination and filtration of massive bodies of information. At the same time she investigates what media—from photography to computers—have always attempted to do: represent, organize and catalogue life into well defined lists and categories (Bookchin 1996). Databank of the Everyday is referred by Christiane Paul (2007:106) as a conceptually infinite database of life itself in all its mundane activities, using elements of the computer database and an image catalogue, and identifying the loop as a narrative engine driving both of them. Other Bookchin's projects appear in Stephen Wilson's Information Arts, Intersections of Art, Science and Technology, 2002, for example the piece *Marking Time* (Wilson 2002:849), in a chapter dedicated to information and surveillance.

Slippery Traces, a project by George Legrady presented in 1995, translates in a dispersed way the autobiography of the artist in an image-driven hyper-narrative. The viewers navigate through a network of over 240 postcards of the 1920s to the 1940s

depicting family portraits, and commercial images of places and cultures (Cook, Dietz & Kiendl 2004). In his statement Legrady writes that the work's intention was the exploration of database structures as a mean of generating multi-linear narratives at a time when web search engines were introduced (Legrady & Comella 1995). Paul (2007:106) understands Slippery Traces as a project that imposes a database logic onto traditional forms of narratives, as a readymade expression, and also a trace of cultural memory (Paul 2008:178). Wilson, in his turn, sees the piece as an invitation to the viewer to navigate a database of 240 postcards that Legrady collected (Wilson 2002:670), and by doing so accessing an individual selection of a collective memory. Each viewer would make posterior associations drawn from the imagery of the archive, enriching and diversifying the possible narratives.

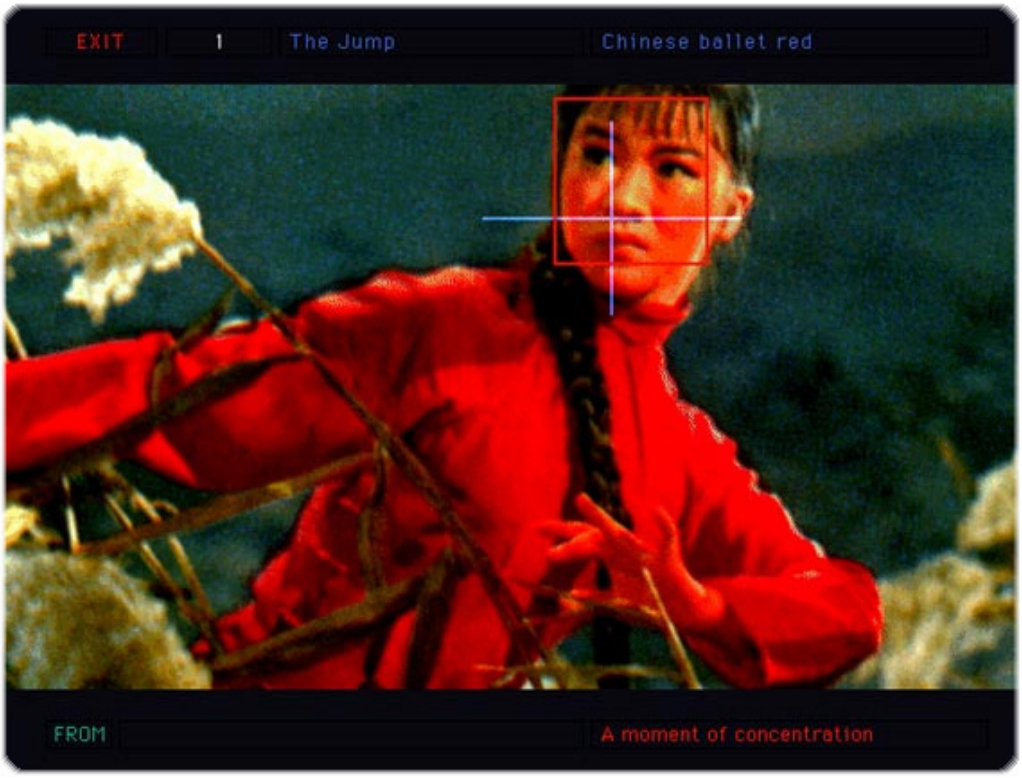

Fig. 10: Slippery Traces (Legrady 1995)

A selection of other artifacts by Legrady considered in the study are, in chronological order: *Eternal Summer,* 2000, a site-specific 4 screen installation commissioned for the waiting room of the *Ebner, Stolz & Partners Corporate Office* in Stuttgart, Germany, and whose concept is to provide customers changing visual scenes that

would stimulate thoughts of Summer memories and chance encounters. *Eternal Summer* is referred by Wilson in a list of resources containing Legrady's projects, compiled under a section called *Databases, Research Processes,* as part of his research for the book *Information Arts* (2002), and Art+Science Now (2010).

Fig. 11: Pocket Full of Memories (Legrady 2001).

Pocket Full of Memories made by Legrady in 2001, was commissioned by the *Centre Georeges Pompidou,* Paris, and was conceived as an Installation piece about the articulations between archive and memory. During its exhibition at the main floor of the *Centre Georges Pompidou,* 20.000 visitors came to view the installation and contributed over 3000 objects out of their belongings, digitally scanning and describing them. The information provided was stored in a database and organized by an algorithm that positioned objects of similar value near each other in a two-dimensional map. This map was being projected with the updates in the gallery

space and made available for review and commenting online (Legrady 2001). *Pocket Full of Memories* is also referred by Wilson's resource quoted above, but Paul presents the project with an explicit focus on the "mechanics" of the construction of a database and on the way by which we arrive at the levels of evaluation through linguistic description (Paul 2007:104). The Installation project then operates at the threshold between logical classification and meanings that are not quantifiable, thus pointing to the potentiality and absurdities of classifying objects endowed with personal meaning (Paul 2008:179). *Pocket Full of Memories* is shown again in 2003 as part of the exhibition *Data Knitting, From Wunderkammer to Meta-Data,* at the *DEAF 03 Festival*, whose program describes the project as centered around the artistic, political, social and software related implications of techniques for data clustering, and taking a fundamental interest in the present; a present that is being condensed into an archive before our very eyes. *The Data Knitting, From Wunderkammer to Meta-Data* exhibition is also a substantial resource of data to this study, as part of a group of initiatives presenting and discussing database-related projects and artistic contexts and forming a thread of connections that helped to definine the study's data identification methods.

Summarizing, Legrady's other contributions to this project database are: *Making Visible the Invisible,* a project being developed since 2005 until 2014 at the *Mixing Chamber* for a commission of the *Seattle Central Library.* It consisting of large LCD screens featuring real-time calculated animation visualizations generated by custom designed statistical and algorithmic software using data received each hour (Legrady 2005). *Cell Tango,* from 2007, which is a dynamically evolving archive of cellphone-transmitted images sent by participants from anywhere within the reach of cellular transmission and reception (Legrady 2006). And *Data Flow,* from 2008, a dynamically generated data visualization commissioned by *Gensler Design* for *Corporate Executive Board Executive Offices,* Arlington, Virginia, consistin of a 3-screen realtime data visualization that features animations of aggregated data based on worldwide communication of *CEB* members (Legrady 2009).

Fig. 12: Making Visible the Invisible (legrady 2005)

Fig. 13: Data Flow (Legrady 2008).

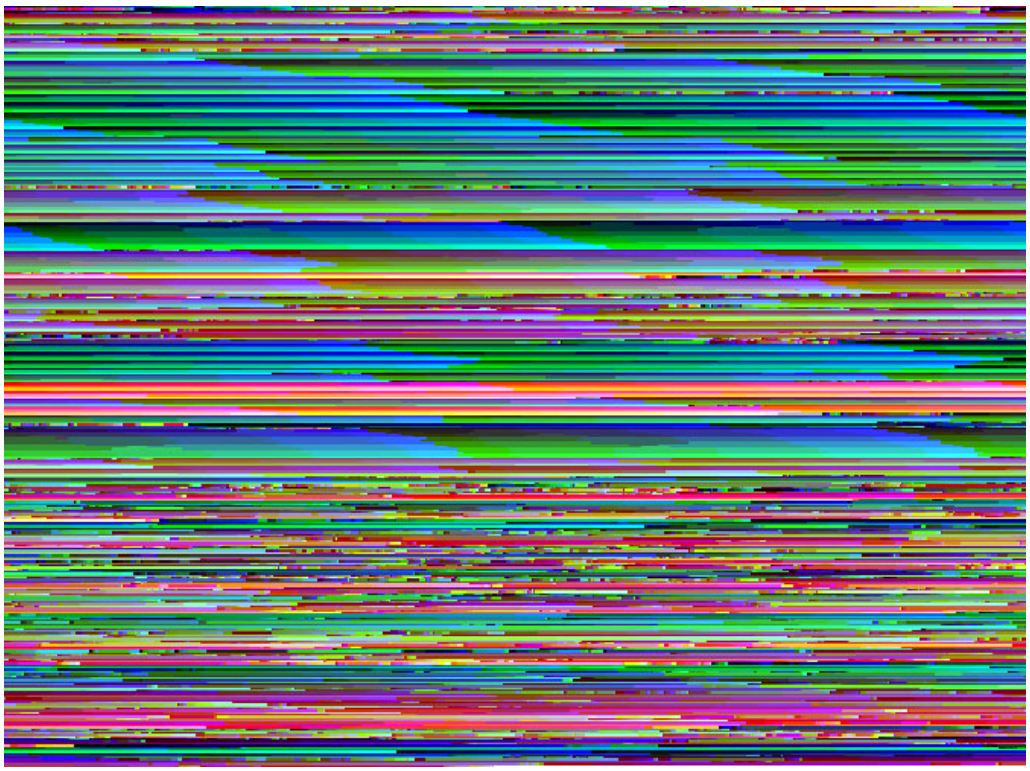

Fig. 14: 1:1 (Jevbratt & C5 1999).

1:1, by Lisa Jevbratt and C5, 1999-2002, includes the creation, maintenance and visualization of a database containing the IP addresses to all hosts on the World Wide Web, it uses the database to create interfaces for navigating the Web, and to generate a new topography of the Web (Jevbratt 2004b). *1:1* was also shown at *The Whitney Biennial 2002 Net Art Selection* exhibition, showing a selection of Internet-based art.

Its presentation text refers that the multiple themes in Net Art that emerged over the years are data visualization and mapping, and database aesthetics. This exhibition is centered in database-related projects and contributes with eight more pieces for the study's data database. *1:1* is referred by Whitelaw (2007) as a project where the mapping of dataset to image is straightforward and transparent, quite unlike conventional information visualization and anti-information, in the sense of information as a formed message. Rather than transforming data into information, Jevbratt translates one form of data into another—symbolic into visual (Whitelaw 2007:4).

Frieling (2004) understands the project as an aim to illustrate the "entire" Internet in a high-resolution image where each dot in every line of color represents an IP address. Therefore the focus of the piece lays on a structural analysis rather than on the iconographic aspect of the screenshot. Liu (2004:13) reasons that *1:1* is the fourth instance of what he calls a small gallery of artistic data pours, past and present, as a classic work of net art and perhaps the epitome of the data sublime. Stalbaum (2004a), mentioning Jevbratt's article *The Prospect of the Sublime in Data Visualizations* (2004-2005), understands it as a response to Manovich's use of the project (1999, 2002) as an example of the anti-sublime aesthetic, while Paul (2008:182) sees it as a way of collapsing the distinction between map and interface, because the interface becomes a 1:1 representation of the environment it portrays.

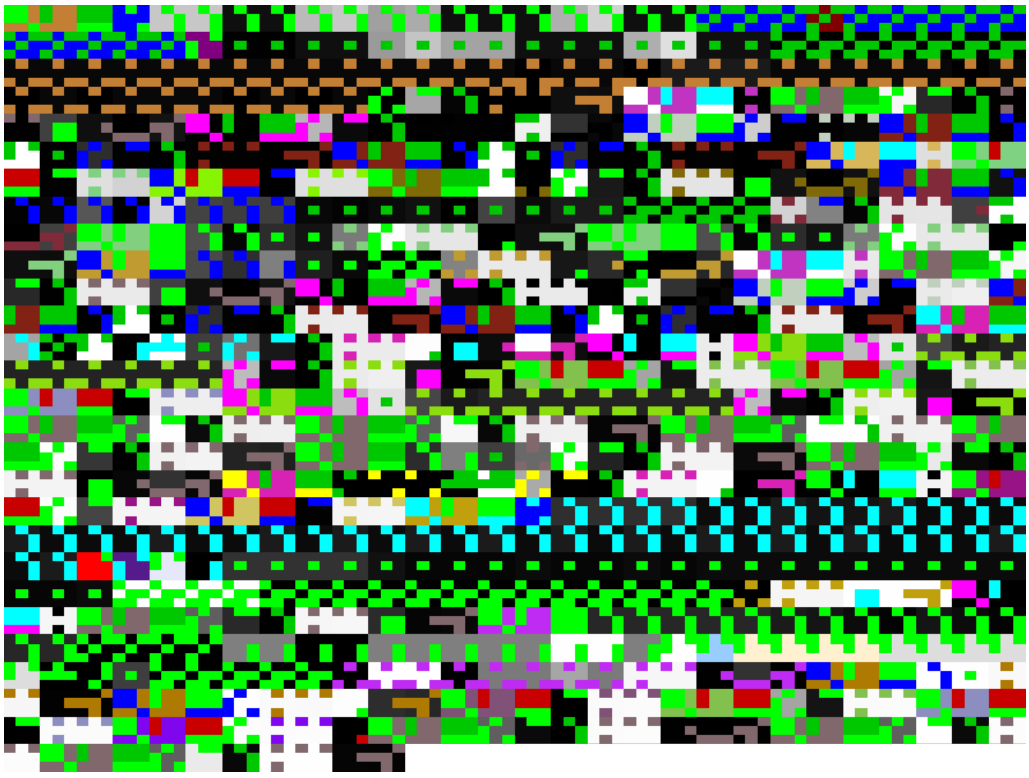

Fig. 15: Infome Imager Lite (Jevbratt 2002).

Lisa Jevbratt contributes with 4 more artifacts to the study's data database: *Migration,* 2002-2005, a different interface for *1:1*, using different colors to track the drift of live addresses on the Internet between 1999 and 2001 that have an even stronger resemblance not just to the media-specific form of Abstract Expressionism but—

anticipating her current work in progress—also the embodied form of DNA gene sets (Liu 2004); *Infome Imager Lite,* 2002-2005, where the transparency of *1:1* is pushed a step further turning over the data gathering and visualization process to the work's audience and offering a platform for in-depth experimentation, exploration and visualization (Whitelaw 2007:4); *Out of the Ordinary,* 2002, a *Radical Software Group's (RSG) Carnivore client,* conceived as a network visualization software which measures and maps the probability of communication between computers on the network that the software resides on, and between computers on the network and the Internet (Jevbratt 2002). Finally *The Voice,* 2006-2009, an ever-changing image of words of what visitors to *SKR's* website are interested in, and how this interest is represented in what *SKR* is doing and believing, the result, as in Jevbratt's *Migration* or *Infome Imager Lite,* is an image that is also an interface to the website (Jevbratt 2005b, 2006).

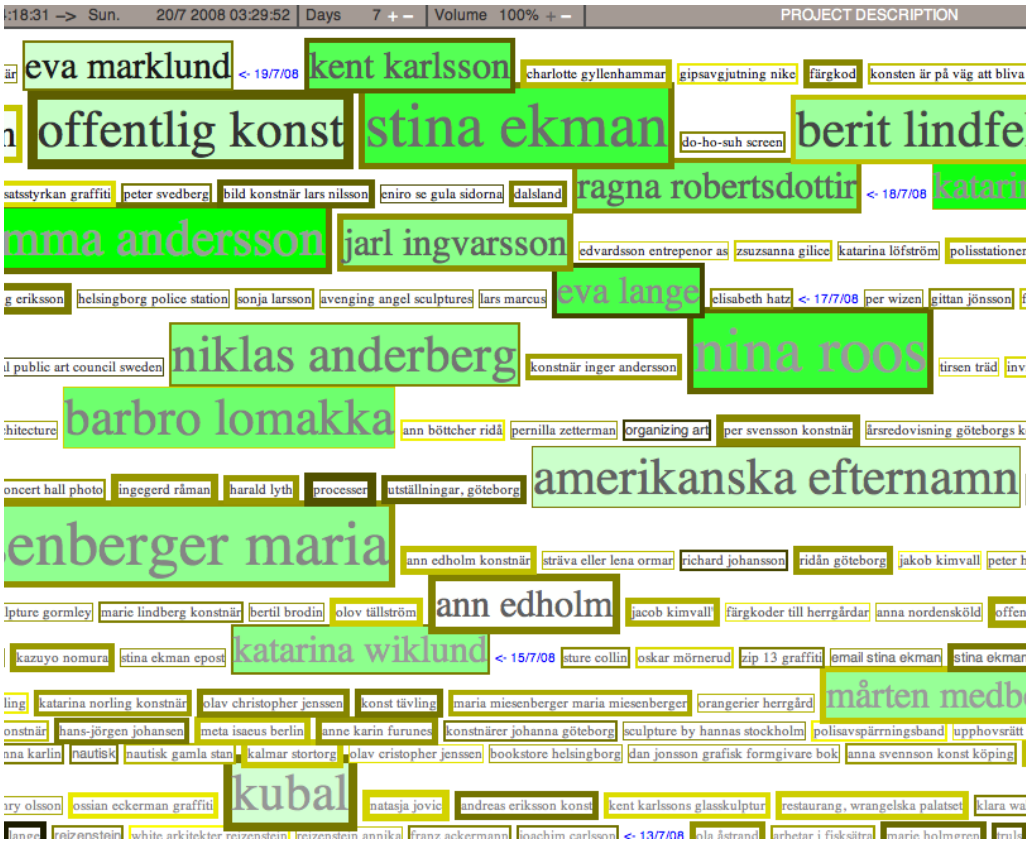

Fig. 16: The Voice (Jevbratt 2006).

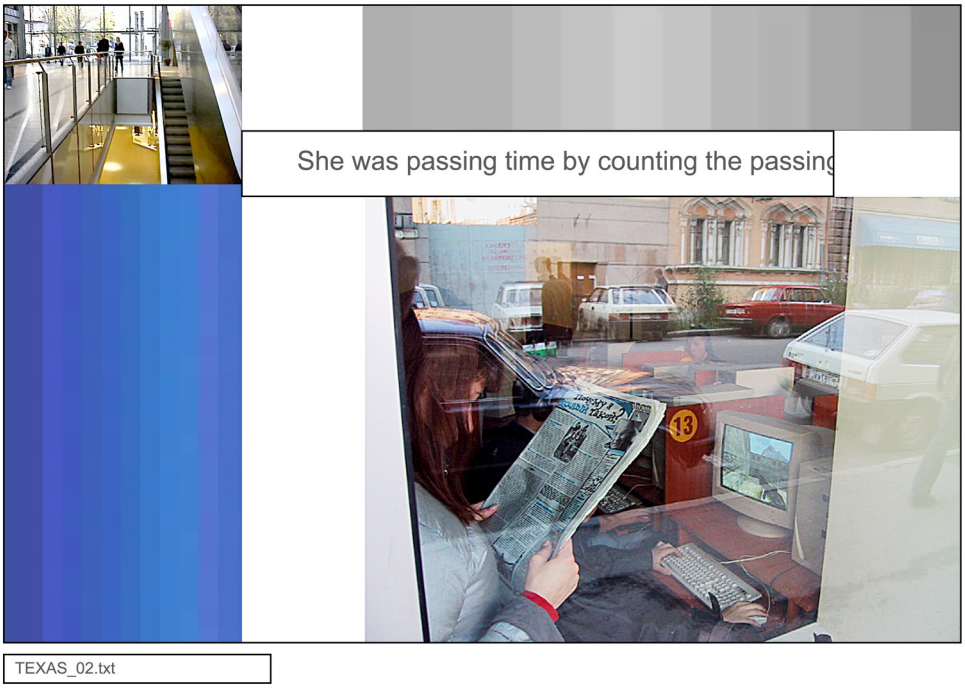

Fig. 17: Soft Cinema (Manovich 2002)

Soft Cinema, by Lev Manovich with Andreas Kratky, 2002, blurs the boundaries between the black box theatre and the screens we come across daily as we walk through any modern city. Rather than beginning with a script, it starts with a large database of hundreds of video clips, images, sounds, text, colors and then generates narratives from it. It is a database-driven movie, which re-imagines cinema as algorithmic, macro, and multimedia (Cook, Dietz & Kiendl 2004). To Lev Manovich, the database is the cultural form of the Twentieth-Century (Frieling 2004), and in the exhibition introductory text Manovich (1998) is quoted as following: "If [with] the arrival of the Web the world appears to us as an endless and unstructured collection of images, texts, and other data records, it is only appropriate that we will be moved to model it as a database. But it is also appropriate that we would want to develop poetics, aesthetics and ethics of this database." When Manovich suggests that, for such a ubiquitous cultural form – and just as happened with the automobile, the skyscrapers, or even perspective – we must imagine the possibilities of databases to be able to actively shape them and participate in how they are used to organize the world we live in (Cook, Dietz & Kiendl 2004).

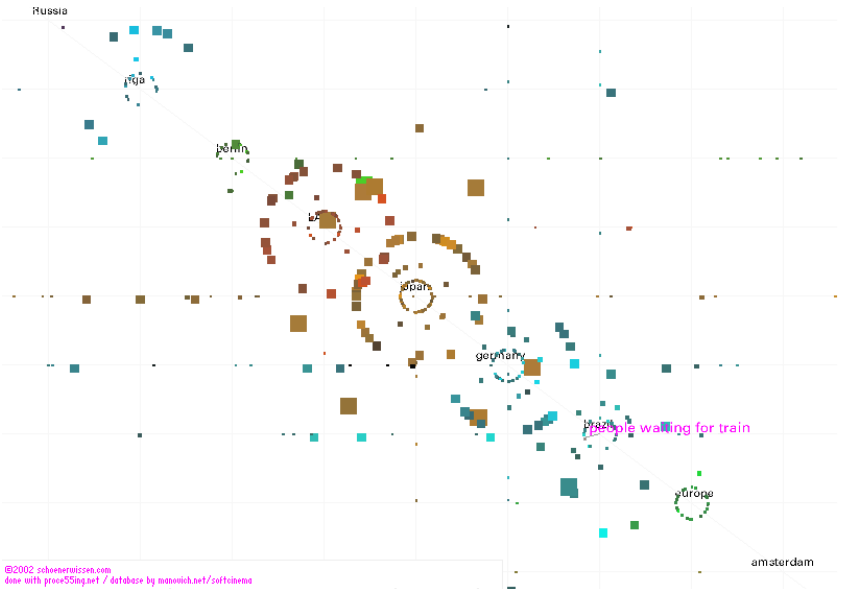

Fig. 18: Soft Cinema (Manovich 2002).

Soft Cinema is also part of the exhibition *Data Knitting, From Wunderkammer to Meta-Data,* 2003, where it is presented as bridging the gap between "today's interfaces and tomorrow's cinema". *Soft Cinema* is referred by Otto (2005) as a work where the author's voice is represented in the written code that drives the algorithms. Stalbaum (2004a) views the project as a cinema that edits and reveals itself in unexpected and often poetic ways. And one is therefore required to apply a thrown and sublime mode of paradigmatic viewership to its interpretation. As a theorist and critic, Lev Manovich (1998, 2000, 2002, 2003, 2004, 2005, 2006, 2008, 2009, 2010 and 2011) has also written extensively on the subject of this study, contributing with a substantial corpus of theory to the study's theoretical framework and data.

Agonistics: A Language Game, by Warren Sack, 2004, is an interface to what he calls *"Very Large Scale Conversations"*, such as happening in Internet newsgroups, that does a linguistic analysis in real time of every message to a newsgroup and computes its interlocutors' discourse positions in relation to each other. The interface has a game component, which places the avatar of the (current) most central player in the debate in the middle of the field (Cook, Dietz & Kiendl 2004). Another project by Sack, *Conversation Map,* 1997-2000, is also a contribution to the study's data. As

Agonistics: A Language Game, Conversation Map also deals with the concept of very large scale conversations in the context of large, electronic-mail lists or busy, Usenet newsgroups. The *Conversation Map* system analyzes the content and the relationships between messages and then uses the results of the analysis to create a graphical interface where the social and semantic relationships that have emerged over the course of the discussion can be seen (Sack 2000).

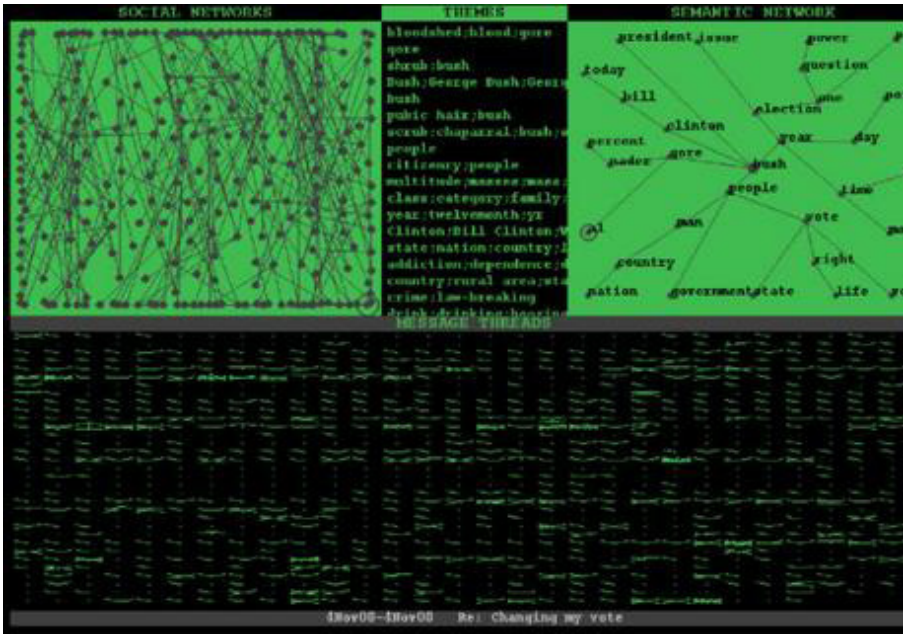

Fig. 19: Conversation Map (Sack 1997).

Conversation Map is referred by Frieling (2004) as being a project that displays spaces for electronic discourse as a complex illustration of a Usenet newsgroup discussion during the American George Bush/Al Gore presidential campaign. This author identifies the project as a powerful self-reflection tool. Dietz (2004) sees the project as a way of mapping, hence enabling a better understanding of very large-scale conversations that happen on the Internet, such as is the case in Usenet groups. Paul (2008:189) describes that project as a dynamic visualization of processes not only created for different forms of data, but also to chart our own interactions, interventions, and communications as a community. The represented contacts happen particularly in forms of communication environments like e-mail and online chat, where the lack of crucial information about social interaction occurs.

Fig. 20: Data Diaries (Arcangel 2003).

Data Diaries, created by Cory Arcangel in 2003, a commission of *New Radio and Performing Arts, Inc.,* is a hack that tricks Quicktime into reading the binary data that passes through the author's computer "random access memory" each day. The result is an opaquely diaristic collection of abstract data 'movies' which chronicle at the bit level his interactions with his computer each day of the month (Cook, Dietz & Kiendl 2004). Alex Galloway (2003) describes the project as a next to nothing simple discovery by the author. Taking a huge data file—in this case the author's computer memory file—and fooling Quicktime into thinking it is a video file. Then press play and any computer's memory is now Video Art. Galloway (ibid) points out that as many artists talk about memory, for artists working with computers, memory has a very specific technical definition, and if every computer had a subconscious, then projects like Arcangel's *Data Diaries,* would be that subconscious.

Lungs-london.pl, is a project by Graham Harwood (Mongrel) made in 2004. The exhibition presentation text reads that it is a Perl software-code poem that rewrites William Blake's 1792 poem *London.* It includes commands linking disparate databases of facts (wars, child health indices, life expectancy, average lung capacity) as

the basis for a sound-based Performance for the Thames Estuary. The new poemcode turns these statistics into variables for computing volume, length and number of breaths of an aggregated set of lungs, as well as their lost capacity (Cook, Dietz & Kiendl 2004). In two steps, the program calculates the lung capacity that is withal pushed through a speaker system in the waveform of a scream (Harwood/Mongrel 2004).

Fig. 21: Lungs: Slave Labour (Harwood 2005).

Lungs: Slave Labour, from 2005, is another Harwood/Mongrel contribution to this study, and presents an instance of the lungs' project using a different database. Richard Wright (2008) refers to this piece as a non-cognitive visualization. According to his article, there are cases when the visualizations move so far from their data source that the relevance of the data disappears almost entirely. In these cases where the original datasets are being used to provide a different output rather than their intrinsic meaning. The article exemplifies this idea with the use of random data to contrive rich patterns using elaborate visualization tools, or as the way noise functions have been used widely in media production software as the starting point

for synthetic image generation. Nevertheless, it suggests that *Lungs: Slave Labour's* power is derived from that very strain of stretching, yet maintaining a connection to their original database (Wright 2008:85). Mitchell Whitelaw (2007) deals with a similar idea in *Art Against Information: Case Studies in Data Practice,* he quotes Manovich (2002) while suggesting that one of the roles in data art is to reflect on data subjectivity, furthering this approach by stating that data art is involved in the construction of that subjectivity. According to Whitelaw, it involves a practical exploration of data's potential uses and meanings; it literally offers us images, figures, for data itself; it pulls us away from information, from the well-formed messages that dominate our experience of digital media; and by directing us instead towards data, it opens spaces for potential, for the distributed reconstruction of information (Whitelaw 2007:8).

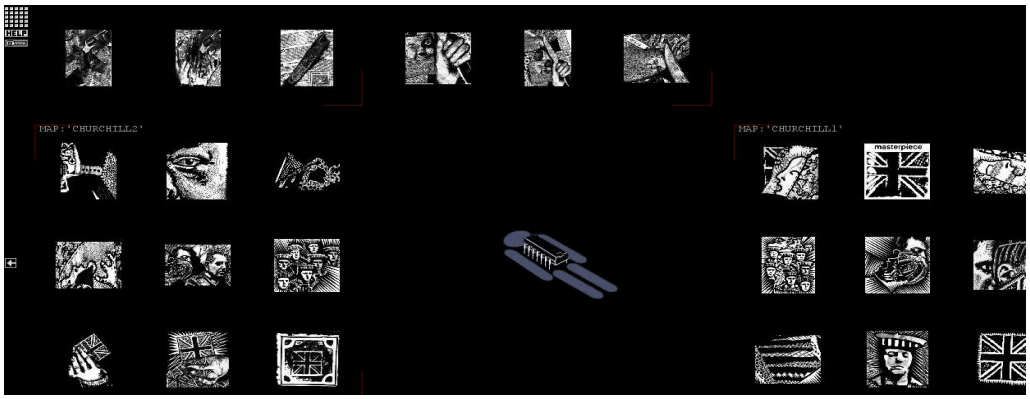

Fig. 22: Nine(9) (Harwood & Mongrel 2003).

Nine(9), is the third project contribution to this study's data by Harwood and the Mongrel collective (2003). This work interests Frieling (2004) for addressing mapping as a collective process. The software, for workshops and working groups, was developed in the context of a concrete social practice, allowing specific communities from the cities where their work was implemented, to participate in their self-representation, in a way that is both engaging to them and a powerful experience for outsiders (Dietz 2004). In Harwood's words, this software is directly born, changed and developed as the result of an ongoing sociability between users and programmers, in which demands are made on the practices of coding that exceed their easy fit into standardized social relations. Dietz describes the software in a greater detail and explains it as an online space that allows each participant to create a "knowl-

edge map" by uploading text, sound, images and video, as well as composing them according to a recurring pattern of nine elements and linkages. These build up into a grid of hundreds of interlinked maps that become both an expression of each participant's personal experiences and a way of visualizing the communal interrelationships between them (Dietz 2004).

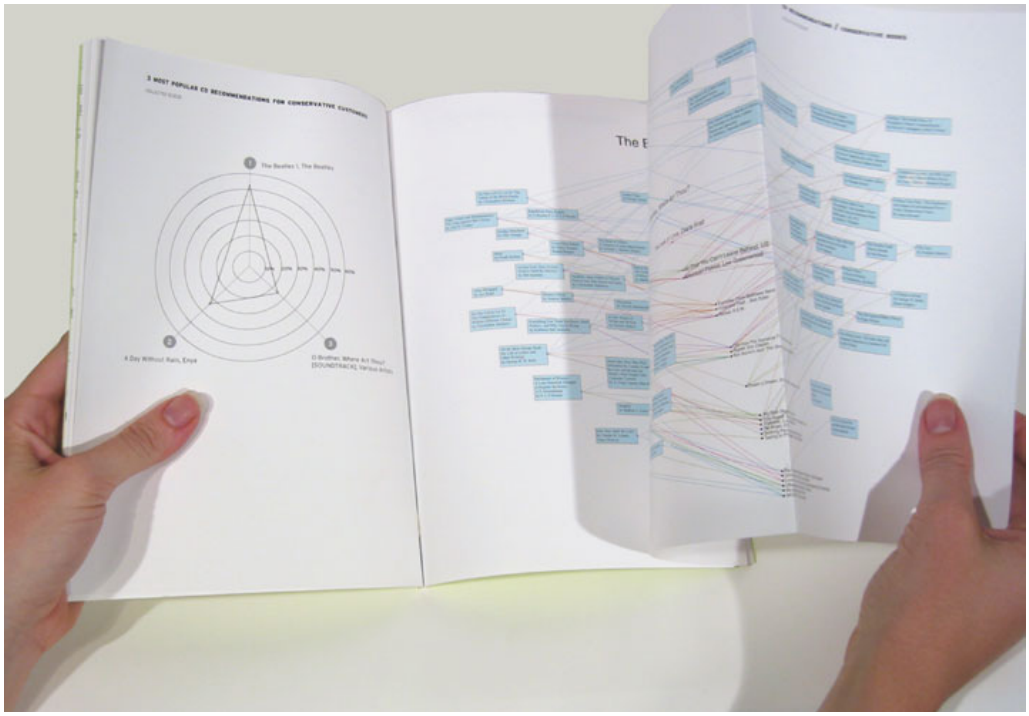

Fig. 23: Data Mining the Amazon (Waller 2002).

Data Mining the Amazon, a piece made by Angie Waller in 2002, explores the database of the online bookstore Amazon.com. There is filtering and mining of its data collected on their users' profiles, as well as a mapping of musical tastes against political poles, following the users' choices while shopping. The exhibition presentation text of the project states that the artist has determined the literary and musical tastes of groups, ranging from the far right to the far left of the political spectrum, while carrying out other mappings of consumers. Employees of Microsoft listen to Nelly Furtado while readers of Margaret Thatcher's biography tend towards opera (Cook, Dietz & Kiendl 2004).

Data Mining the Amazon is also an evidence of the massive data-flood that corporations are harvesting with electronic technology, such as barcodes and the overall computerization of business transactions. The analysis or data mining of this data is what provides the companies with information to predict and map the users' trends that in the specific case of Amazon allows the company to make purchase recommendations to their customers. Waller's project put this tactics into a political context and questions the way this media and commercial trends disseminate from this global outlets into public opinion (Cook, Dietz & Kiendl 2004). Waller (Waller & Brucker-Cohen 2003) states that Pierre Bourdieu (1984) concluded that the way we classify things (operas, desserts, leisure activities) is inextricably tied up with the way we classify ourselves and others as social beings. She also says that *Data Mining the Amazon,* borrows this philosophy by re-appropriating marketing recommendation strategies to draw conclusions about political beliefs and aesthetic judgments (Waller & Brucker-Cohen 2003).

Fig. 24: How I Learned (1-4) (McCoy & McCoy 2002).

How I Learned (1-4), by Jennifer and Kevin McCoy, 2002, utters the following question: *What would you know about the world if the only thing you saw were episodes of Kung Fu?* (McCoy & McCoy 2002). The exhibition presentation text of the

project mentions that the authors catalogued all the individual shots from all the episodes of the 1970s television show *Kung Fu*. They furthermore recompiled the shots according to genres on over 100 color-coded CDs, wich the viewer can choose to watch lessons about "Nature and Society", "Religion", "Capitalism" and "Film-making" (Cook, Dietz & Kiendl 2004). Paul (2007) refers to the McCoys' work as an experiment with a form of enhanced cinema that uses the database logic as a formal strategy and carries the medium of film/video into the realm of digital art. This is made possible by fusing the inherent characteristics of both media, and while the works appear to be video installations in the classical sense, they would not be possible without the digital medium's inherent possibilities for the classification and reconfiguration of existing materials in a database structure (Paul 2007:102).

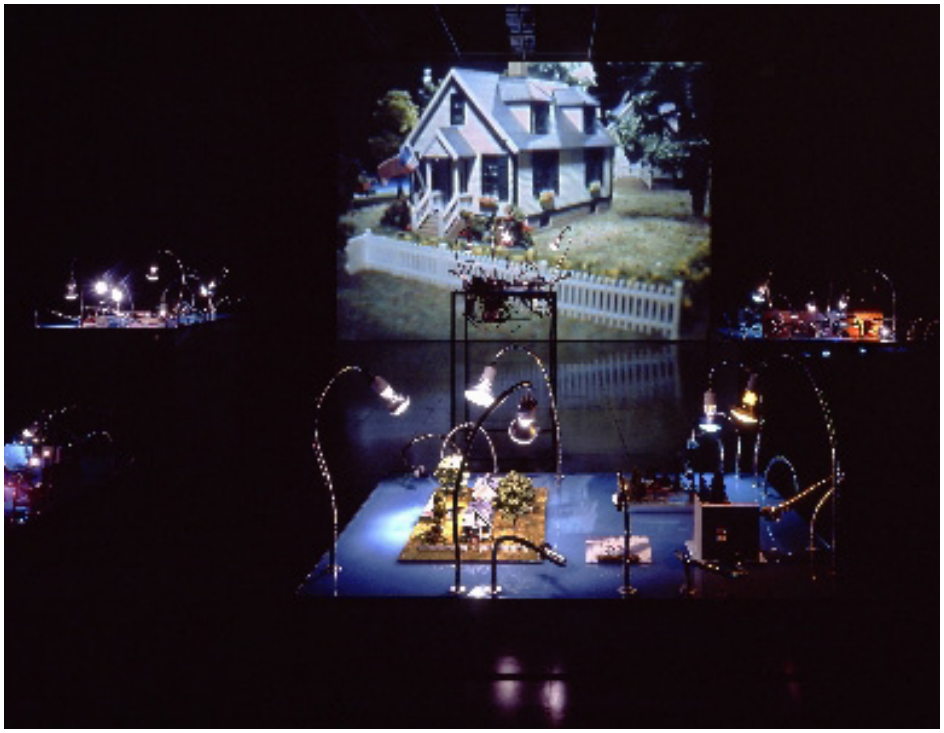

Fig. 25: Soft Rains (McCoy & McCoy 2004).

Soft Rains, made in 2004, is another project by Jennifer and Kevin McCoy pertinent for this study's data. The data for the aforementioned database structure is gathered with over fifty miniature video cameras, from a set of seven tabletop platforms holding miniatures, lights, the micro video cameras and electronics. The cameras frame images of the models which, when edited together through a live computer-

controlled editing system, make short, fragmentary films (Vesna 2008). *Soft Rains* makes visible the process of filmmaking, outlining its roots as a databased medium, and turning it into a live digitally enhanced real time automated experience.

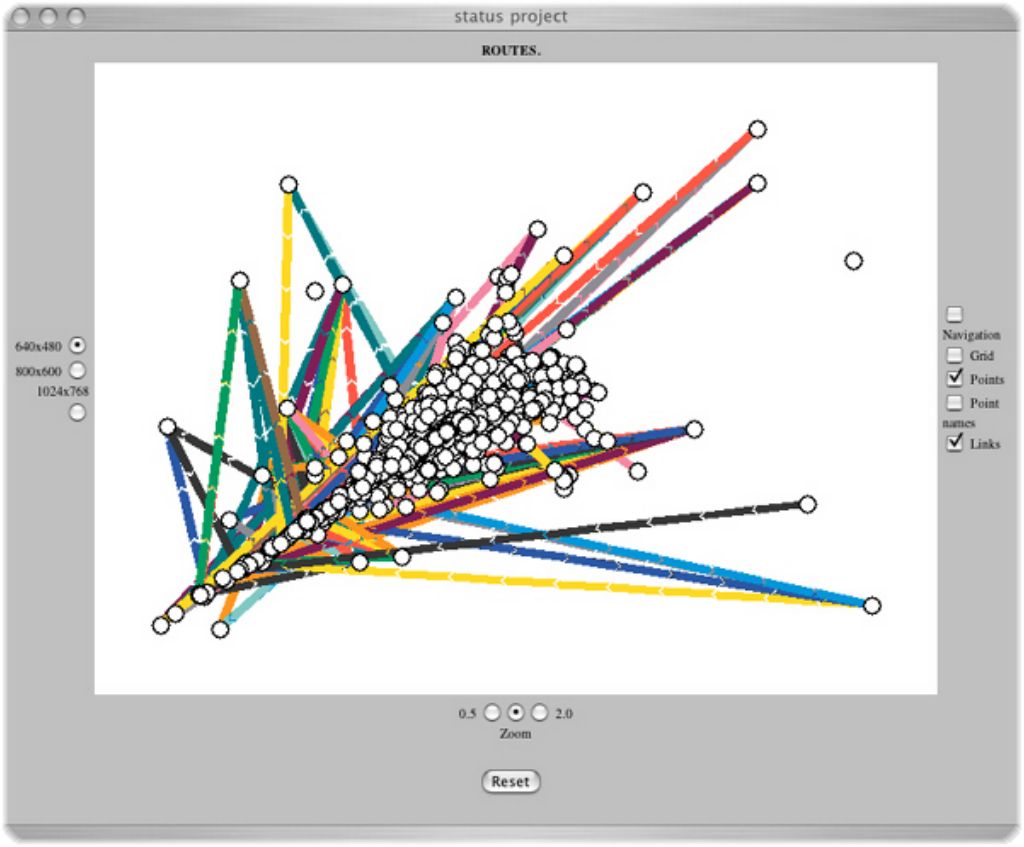

Fig. 26: The Status Project (Bunting & Brandon2004).

The Status Project, made by Heath Bunting and Kayle Brandon in 2004, is described as a database of *Do-It-Yourself* strategies to meet the bureaucratic requirements for the possession of official identification – from birth certificates to passports –, allowing its users to create or dissolve identities, as well as to merge two different persons' identities. Large-scale prints plot a user's official status creating maps not based on residency, citizenship or birthright but on mobility (Cook, Dietz & Kiendl 2004). Elisabeth Bard (2004), in an article published in *The New York Times,* that is included in the artist statement section of the exhibition Website related to Bunting & Brandon's project, outlines the political and human aspects of the project stating that the database uses the rules of formal logic to define relationships between statuses, as such, "If you are a blood donor, then you are not an injector of drugs,

taking antibiotics, a prostitute, gay or less than one year from having a piercing". This author says that the project is not just a conceptual costume drama, an art-world game of social dress-up, but a strong plea for a more nuanced consideration of identity and borders in the post-9/11 political climate. In a sense, the two artists are frantically waving their hands in the air, saying it is not all that simple to tell the difference between "us" and "them."

Fig. 27: Swipe (Da Costa, Schulte & Singer 2002).

Swipe, created collaboratively by Beatriz da Costa, Jamie Schulte and Brooke Singer in 2002, uses the barcode magnetic stripes on drivers' licenses to reveal to the visitors of the gallery that databases are a crucial technique of power in today's social field (Cook, Dietz & Kiendl 2004). The artists state that the *Swipe* Performance directly confronts the public with today's data-collection practices and gives people free access to their own data image. People who approach the bar in search of a refreshing drink will be asked by a bartender (a *Swipe* member) to show a driver's license for age verification. The bartender not only looks at the license, but also places it in an automatic scanning device. While the bartender prepares the drink order, the *Swipe* cash-register matches the driver's license information with remote and lo-

cal databases and runs a demographic analysis. Within minutes, a data "receipt" is ready and is delivered with the drink to the customer (Da Costa, Schulte & Singer 2004). Sarah Cook (McGarry 2005) points out that people don't give databases much thought until they awkwardly bump into one. She adds that the recognition of the database and its action in everyday life emerges having a greater and more profound effect, as it happens in the Swipe Installation piece, because it operates from familiar settings but shapes into unexpected expressions.

Fig. 28: Template Cinema: Short Films About Flying (Thomson & Craighead 2002).

Template Cinema: Short Films About Flying, was developed by Jon Thomson and Alison Craighead in 2002, and is described as using the vast database that is the Web to create an endless number of short films by recycling existing data. The initial genre piece, *Short Films about Flying,* matches a live feed from a web-cam from *Logan Airport* in Boston, with a single random selection from a database of over 150 audio soundtracks (which were all directly sourced from Internet radio feeds) and random selections from a database of over 200 inter-titles (sourced from online message-boards) (Cook, Dietz & Kiendl 2004). *Template Cinema: Short Films About Flying* is yet another instance of a data-based film created in real time. A predefined template or set of instructions constantly generates new narrative structures from random sources of data collected from the Web and, while the predefined template remains a constant, the output is a random variable that is never replicated.

Fig. 29: Unmovie (Pocock 2002).

Unmovie, created by Philip Pocock, *onesandzeros,* Gregor Stehle and Axel Heide in 2002, is described as an online participatory cinema project. By the time of the *Database Imaginary* exhibition in 2004, a "cut up" of *Unmovie* had been streaming live since November 10, 2002. The film itself is generated dynamically by queries to a database of existing net video clips catalogued by keywords. Those queries constitute a mutating "script" generated by a conversation in an online chat-room-like setting, with online users and AI personalities (bots) ranging from 13th Century Zenmaster teachings and Nietzschean philosophy to Bob Dylan song lyrics and Andy Warhol solipsisms (Cook, Dietz & Kiendl 2004). The authors describe their project has an open system of "actor-media" and participants whose emergent dialog on the "Stage" becomes the Script for an always-unique playlist of Internet video clips (the "Stream"), thus able to generate a mutating, never-repeating "unmovie" (Pocock et al. 2004). Dietz (McGarry 2005) refers both to *Unmovie* and to *Template Cinema* as

projects that examine ways in which discrete data can be sequenced in a potentially infinite number of ways, from which we extrapolate stories, and says that the question of "how do we make sense of all this data?", is a central issue of our time.

Mobile Scout: A Field Guide, is a result of a collaboration between Julian Bleecker, Scott Paterson and Marina Zurkow in 2004. The project is better described as the use of telephones and Interactive Voice Response technology to allow the audience to record their experience of place. The idea is to use vocal contributions by users of the Mobile Scout phone to build a sonic field guide. These contributions are descriptions of the flora, the fauna and the behaviors present in the surroundings of a place, based on the experiences of more or less transient inhabitants, and made available to a larger audience on the Internet (Cook, Dietz & Kiendl 2004).

Fig. 30: Ecyclopaedia (Curral 2000).

Encyclopaedia, made by Alan Curral in 2000, is described as a humorous play on the limitations of the personal point of view using the encyclopedia format. Curral's friends and relatives, whom he consider to be his central database of knowledge and the most important contributors to his world-view, describe on video and without cuts or edits, all that they recall about a series of topics ranging from cheese to Frank Zappa. The described topics covered in the encyclopedia were chosen by each speaker from lists of words abstracted from the previous contributor's entry (Cook,

Dietz & Kiendl 2004). Curral (2004) believes that more than two-thirds of his knowledge comes from this sort of random linking between subjects. The resulting associations are similar to one's exposure to hipertext on the Internet, as well as the way in which an act of research leads to an array of endless possibilities and paths. In *Encyclopaedia* the parents of Curral' are the ones who provide the primary input of subjects and words that afterwards are to be explored by other Curral's relatives and acquaintances. This vision of the elder as the information keepers is similar to Selena Sol's (1998) idea of people as databases, when he states that in the primitive days before computers "the amount of information shepherded by a group of people could be collected in the wisdom and the stories of its older members. In this world, storytellers, magicians, and grandparents were considered a great and honored storehouse for all that was known. Apparently, and according to vast archeological data, campfires were used (...) by the younger members of the community to access the information stored in the minds of the elders."

Fig. 31: Zapped! (Preemptive Media 2005).

Zapped!, created by *Preemptive Media* in 2005, investigates the mass deployment, use and misuse of Radio Frequency Identification (RFID) technology. The project starts from the premise that the daily encounters (whether known or not known) with this technology would soon be commonplace, *Zapped!* constitutes an effort to learn about, and respond to, the tags that industry is adopting for product-tracking, the

government for border control, and public libraries for automatic checkout (Cook, Dietz & Kiendl 2004). In the frequently asked questions section on the *Zapped!* Website, *Preemptive Media* states that although RFID technology is not inherently bad, and can even present benefits if the companies operate the systems correctly by protecting the data collected and not using it for undisclosed purposes, there are other contexts that constitute a misuse of the RFID technology. The misuse of collected data could result in the institutional electronic tracking of humans, the surreptitiously collection of data from tags that can be linked to specific individuals, the inadequate encryptation of personal information, the use of collected data for any purpose other than the primary and accorded intention, (…) or to track students and automatically alert school administrators and police of student whereabouts (Zapped! 2005).

Zapped! underlines *Preemptive Media*'s concerns about what the group describes as *AIDC* (Automatic Identification and Data Collection) technologies, particularly because they are invisible and discreet, they don't notify or ask for its subjects consent for the collection of their data, and they are part of an unregulated industry of data collection in the U.S. that increasingly manifests the developing alliance between business and government in the trade of personal information (Zapped! 2005).

Fig. 32: Things Spoken (Hegedüs 1999).

Things Spoken, made by Agnes Hegedüs in 1999, is understood as the second part of a project that deals with different aspects of memory and visual archetypes. The artist scanned and catalogued fifty of her belongings and in the resulting CD-ROM-based art work, the user can choose to sort them by size, weight, color or function. Other more subjective criteria such as in the case of gifts, the gender of the persons who gave the objects to the artist, are also possible to adopt (Cook, Dietz & Kiendl 2004). *Things Spoken* deals with the subject of personal databases and the way memories emerge from the singularities and the (inter)relationships of everyday objects, particularly for the fact that they carry a personal meaning and significance to its owner. The objects' singularities are recalled orally by the author or by the author's friends and audio is recorded. These materials offer layers of parallel narratives that the users' of the work can freely navigate.

Fig. 33: Faculty of Taxonomy (University of Openess 2004).

Faculty of Taxonomy, is a project made by *The University of Openess* in 2004, supported by a residency at *Isis Arts* in Newcastle. *The University of Openess* is an online, open source and unaccredited university, wich created the so called *Faculty of Taxonomy* as one of its branches for the *Database Imaginary* exhibition. The *Faculty's*

activities were exhibited at the *Banff Centre Library* and included takeaway game sheets for playing "categories" and a distributed, anti-systemic library of readings about taxonomies and databases. The users were invited to contribute to the readings and to re-catalogue the texts (Cook, Dietz & Kiendl 2004). According to The *University of Openess,* The *Faculty of Taxonomy* was founded to investigate categorization structures, classification schemas and look up the various ways that people have developed to deal with the mess of life (University of Openess 2004).

Fig. 34: Shelf Life / Drawing Conclusions (Poitras 2004).

Shelf Life / Drawing Conclusions, made by Edward Poitras in 2004, is described as an Installation piece, an online art work, and a memorial to Louis Riel. Riel was a prophet, a poet, and a leader of a tribe of mixed Native Americans called *Métis* living in Western Canada. The project has a number of interconnected threads concerning how history is represented through the organization of data, particularly how one deals with new information and interpretation, selective information or omissions and misinformation or observation (Cook, Dietz & Kiendl 2004).

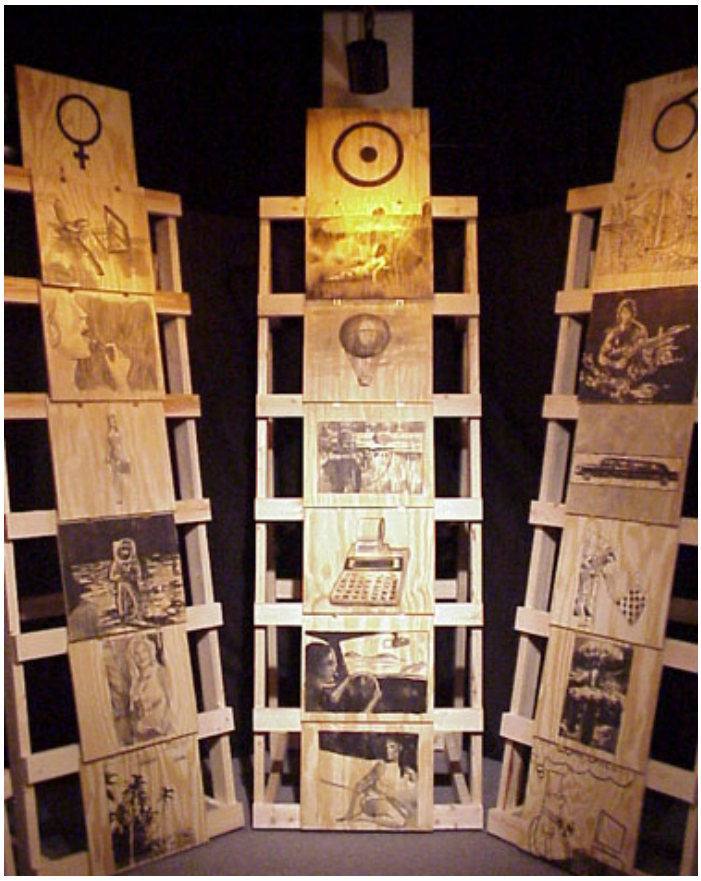

Fig. 35: Memory Theater (Helguera 2004).

Memory Theater, by Pablo Helguera, 2004, recreates a sixteen Century "theater" imagined by the philosopher Giulio Camillo, in which 49 symbols could represent all the knowledge of the universe, human and divine, in a systematic interrelated order. He updated the idea by working with community groups to identify the community-specific icons of our "universal" knowledge, which is then exhibited as a freestanding contemporary *Memory Theater* (Cook, Dietz & Kiendl 2004). The first recreation of this project was done at the University of Montana where students were asked to convey images searched on a Google database that best represented Camillo's original symbols. For the *Database Imaginary* exhibition, the author worked with the *Banff Community High School* to choose the forty-nine icons of this *Memory Theater* version. Dietz (McGarry 2005) sees Helguera's piece as part of a notion related to an aspect of a "longer history" and evoking the idea that "database thinking" existed long before the creation of actual databases.

Fig. 36: The Giver of Names (Rokeby 1990).

The Giver of Names, is a project started by David Rokeby in 1990 and is still in progress. At first was partially motivated by a commission from the *Kiasma Museum of Contemporary Art* in Helsinki, with the financial assistance coming from the *Canada Council for the Arts* and the *Ontario Arts Council.*

The Giver of Names' Website describes it quite simply as a computer system that gives names to objects. The exhibition presentation text states that the Installation invites the viewers to select from a heap of plastic toys and place them in front of a computer camera. The system would attempt to isolate and identify the objects using the artificial intelligence software developed by the author for over a decade. The software then uses "self-taught" language to create machine poetry (Cook, Dietz & Kiendl 2004). The debut presentation of part of the project occurred in a former version under the title *The Wanderer,* included in the exhibition, *Disembodied Mind, InterAccess,* held in Toronto in 1997. The visual perception aspect of *The Giver of Names* took shape only in 1998 and was shown through a rudimentary vision system

at the *Macdonald-Stewart Arts Centre* at the *Guelph University* in Ontario. The presentation of the full *Giver of Names*, using an enhanced vision system and bilingual capabilities, took place at Oboro in Montreal, in 1998. A third version with a projection above a pedestal, was prepared for the *"Alien Intelligence"* show at the *Kiasma* in Helsinki, in 2000 (Rokeby 2002).

Fig. 37: TreatyCard version 2 (tcv2) (Waynohtêw 2002-2004).

TreatyCard version 2 (tcv2), a project developd by Cheryl L'Hirondelle Waynohtêw between 2002 and 2004, concludes the *Database Imaginary* set of artifacts' description, all of which are included in this study's data. The presentation text states that this online work is an attempt to address relations between natives and non-natives by reexamining the intent, issue and details of the Canadian Government's 'Certificate of Indian Status'. This certificate, more commonly known as a 'Treaty Card', is intended to track the movement – spending patterns, prescription drug use, doctor and dentist care, police contact, Social Services use – and institutionalize the identity of "...Indians within the meaning of the Indian act (Cook, Dietz & Kiendl 2004). The *Treaty Card version 2* allows anyone to log in and create a new or alternate version of their card that better reflects their relationship with the land and state. Even more important than that depiction, as Carry Gates (2003) says in the project's artist statement section, the project enables the understanding of some of

the complex issues existent in Canada, concerning postcolonial relations between First Nations peoples and other Canadians.

All the artifacts in the *Database Imaginary* exhibition have been described according to their presentation texts and its artists' statements. When possible the descriptions were triangulated with references to the artifacts published in articles by authors relevant to this study. Other artifacts included in the study's data database created by the same authors participating in the *Database Imaginary* exhibition were also described along with those shown at that same exhibition.

The thread that allowed the identification of the sample units for this study evolved through the connection of Lev Manovich's project, *Soft Cinema,* to the *Dutch Electronic Arts Festival (DEAF03) Exhibition,* named *From Wunderkammer to Meta-Data,* held in 2003. Under the main theme, *Data Knitting,* the *DEAF03 Festival Exhibition, From Wunderkammer to Meta-Data,* is described in its Website as interactive art that addresses the issue of archives and databases in an ingenious, witty and confronting way, while highlighting the role and increasing importance of information in our knowledge society. While acknowledging the importance of information, the project underlines the fact that people is being overwhelmed with the very same massive stream of information that it is supposed to provide enlightenment. It also calls attention for the fact that while the experience of the world is increasingly global, the presence of the local is also rising accordingly. On the one hand, we, as individuals, are being bombarded with streams of information that are "out of control" and tend to confuse rather than enlighten us, while, on the other hand, these streams of information are heralded as the great providers of knowledge. The visitors to the exhibition can interact with the artworks at several levels by changing and manipulating them. In this way they can use the databases and archives these artworks deploy, to generate experiences and images of a world that is forcing itself upon the users as increasingly complex and global, but which at the same time grows incessantly local (From Wunderkammer to Meta-Data 2003).

The DEAF03 Data Knitting, From Wunderkammer to Meta-Data, Festival develops its program from the notion that the media are shifting from means to represent reality to ways of constructing such realities. Accordingly, and in order to investigate

how different media shape reality, the Festival's program focused on the artistic, political, cultural, social and software-related implications of techniques for data clustering, and the acknowledgement that the festival "present" was a present which was condensing itself into an archive before our very eyes (From Wunderkammer to Meta-Data 2003).

The *Festival* presentation text highlights the archive, or its operative capacity as a database, as a strong metaphor in several contemporary views, and providing related examples: the human body as a genetic archive digitally opened by the *Human Genome Project;* the idea of institutionalized culture, laying in museums, art institutions, magazines and cultural supplements, as an archive that the *new* art is supposed to react against or penetrate to achieve legitimacy; our own language as an archive of meanings to be unlocked by philological methods; the unconscious as an archive of traumatic experiences and identity; or history as a database from which facts can be arbitrarily retrieved.

That text argues that the postmodernist view of "fragmentation" of everything in the archive of history is related to the way in which data was stored and retrieved in the early days of the information age. Back then, and digitally speaking, data was all equal, because of the lack of Meta-Data, the new form of structuring digital archives that establishes a correlation and relationships between the various data through extra data. This extra data is in its turn archived along the data to which it refers to, therefore allowing a form of categorization and description of data that was nonexistent before the use of nonhierarchical and nonlinear search engines. In the same text there is a suggestion that meta-data constitutes a mean to organize, hierarchize, streamline, and evaluate what becomes an important social, political and economical instrument in the information sphere.

Information, as an output of data (Whitelaw 2007), leads to knowledge, and that in the quoted text above is described as tagged, or intelligently grouped and combined information. Cosequently, it is the result of the knowledge management of data or data clustering, and a tremendous source of power (From Wunderkammer to Meta-Data 2003).

Archives are no longer just about collecting our past for the sake of history, but became a state in which we permanently live in. Every human activity that involves digital probing is feeding the world-as-archive, and it is also in the world as a constellation of databases that the policies for the future are being planned, from marketing strategies to decisions about where to build shops. Behind every activity in the hard, material world hides an immaterial archive (From Wunderkammer to Meta-Data 2003).

A set of questions concerning the role of the individual when dealing with databases and its connections, are articulated in the same text, in relation to the role of databases in activating the present. The text states that because they are continuously available and accessible, the archives have become an essential factor acting in the present. One could even say that archives have become crucial in how the present is created and reflected upon. Archives are starting to shape responses and decisions, as much as only the real present used to motivate. In this sense, the individual's experience of the present can be increasingly described as the moment when an "unforeseen" link is forged between tagged information clusters that reach him or her through the media (From Wunderkammer to Meta-Data 2003).

The DEAF03, From Wunderkammer to Meta-Data presentation text ends by underlining the preoccupation of the Festival's program to investigate the use of databases, software and archives as subjects of artistic exploration. The presentation of such diverse work by artists, collectives and architects who created software-based systems as strategic tools and agents, was intended to promote the development of independent thought in order to surpass the limitations of database knowledge upon its users.

In addition to the projects by Lev Manovich's (2002), *Soft Cinema,* and George Legrady's (2001, 2003-2007), *Pocket Full of Memories* — already located as part of the *Database Imaginary* exhibition, the study advances to describe the selected sample units from the *DEAF03 Exhibition, From Wunderkammer to Meta-Data,* presented in the *DEAF03* Exhibition Website.

Fig. 38: Worldprocessor (Günther, 1989).

Worldprocessor, by Ingo Günther, is an Installation piece and a work in progress that has been successively expanded since 1989. It uses illuminated globes to map sociological, political, and scientific phenomena. Vande Moere (2005) describes it in its Infosthetics entry, as a collection of about 200 beautiful physical world globes, showing the geographical distribution of various parameters, including relative military expenditure, temperature changes, population, energy consumption, pollution, wealth, refugees, or life expectancy. Günther, refers to the project as a 'world fair' of more than 100 illuminated globe sculptures highlighting "global" issues, while Frieling (2004) describes the project as one of four mapping strategies, where data is used to transform objects. He states that Günther picks up the globe shape in order to generate an abundance of interpretative maps of the world, in a critique of the predominant view taken by the political world map, in which global data—often military in origin—is displayed in a graphically simple way, and able to produce new constellations and representations of 'world' (Frieling 2004). In Wilson (2010) the *Worldprocessor*'s presentations are considered as overwhelming in their luminous beauty and richness of information, and there is an agreement with Günther on the importance of the visualization of information: "today, we as individuals can only hope to know a fraction of human learning. As a result, interfaces, symbols

and navigational tools have become critical to establishing our sense of place in the world — intellectually, physically, and ultimately emotionally." (Wilson 2010:194)

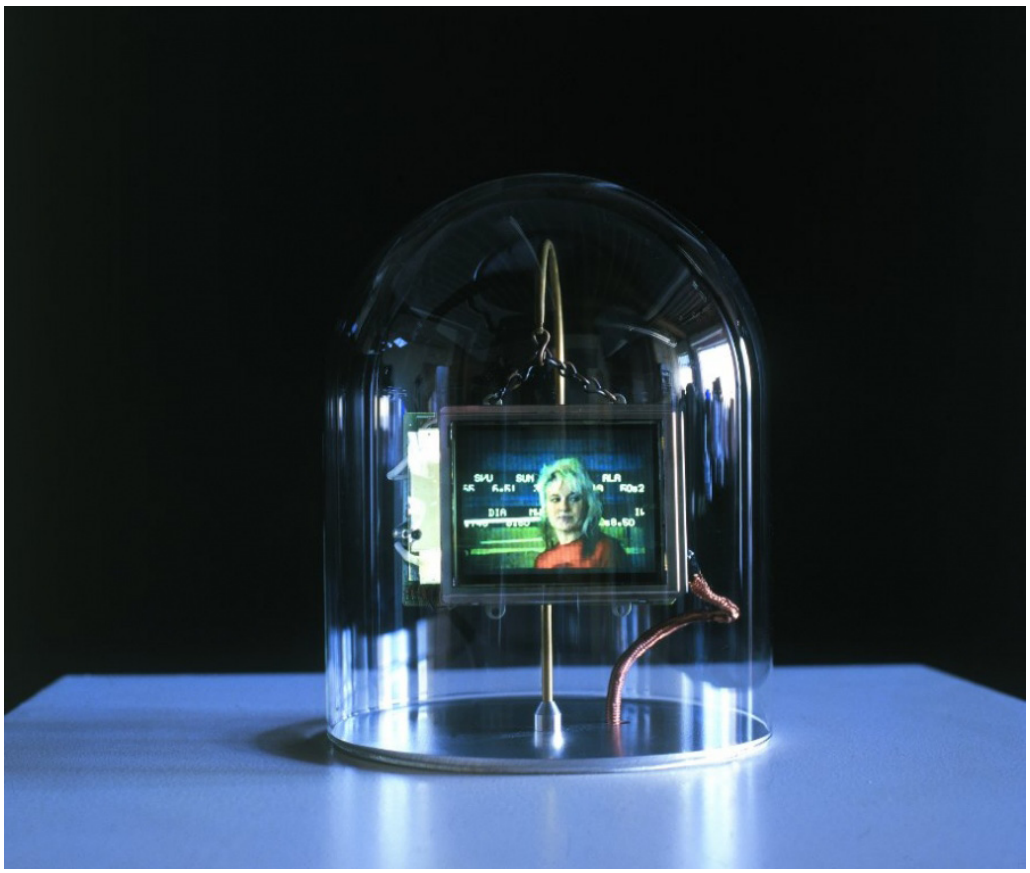

Fig. 39: Synthia (Hershman 2002).

Lynn Hershman participates with *Synthia (Stock Ticker),* developed between 2000 and 2002, and *Agent Ruby.com,* from 2002, which are categorized in the Festival's literature respectively as a network project and a Web project. The text description subtitles *Synthia* as "Information as Art, Art as Information" and describes it as being a virtual character who represents fluctuations in the stock-market online. Her behavior is triggered by the most recent information on stock prices and her mood changes according to the atmosphere at the stock exchange. *Synthia* dances if prices go up and sits anxiously at her desk if they go down. *Synthia*'s design is a plasma screen encapsulated in a bell of glass of an electronic ticker tape, inspired by Thomas Edison, who made a significant contribution to the electric exchange-rate telegraph.

Synthia is thus presented as a symbol of the symbiotic relationship between market and people (Hershman 2003).

Paul (2007:99) refers to *Synthia* in the context of visualization and 'dynamic mapping' of real-time data streams. She groupes that piece along with Martin Wattenberg's *Map of the Market,* Nancy Paterson's *Stock Market Skirt,* and John Klima's *ecosystm* (described later in this text), and considers them able to provide four radically different interfaces for understanding the stock market or financial data.

Fig. 40: Agent Ruby.com (Hershman 2002).

Agent Ruby.com is described as a seductive character introduced by Lynn Hershman for the first time as the character *Agent Ruby* in her feature film *Teknolust* (2002). Ruby, a female clone chat-bot, part human, part robot, returns online as an artificially intelligent Web Agent that visitors to the Website can engage with. *Agent Ruby* is coded in a language called *AIML* (Artificial Intelligence Markup Language) that allows her to learn like humans, through stimulus-response. Ruby's identity is constructed from the data that its visitors submit to her Website.

Fig. 41: PoliceState (Brucker-Cohen 2003).

PoliceState, made by Jonah Brucker-Cohen in 2003, is a *Radical Software Group's Carnivore* software client. The description text of the project starts by explaining that Carnivore is the nickname of an FBI surveillance software, that was made public and available to designers and artists' experimentation by the *Radical Software Group* in that same *Carnivore Project.* The open source version of *Carnivore, CarnivorePE,* sends data from all kinds of Internet traffic to a selected group of computer artists who interpret and process the data differently and into creative interfaces that are called clients. Other carnivore clients are also included as data to this study's database. The *Carnivore project* questions directly the legitimacy of government undercover surveillance techniques, and through its 24 identified clients, explores the creative visualization of data streams (Brucker-Cohen 2003).

PoliceState, one of the carnivore clients, makes visible the data traffic using 20 radio-controlled miniature police cars simultaneously fed with data taken from the *DEAF03* network. The software 'looks' for keywords blacklisted as indications of a

terrorist attack on American territory and then translates them by *PoliceState*'s software into an actual radio police code, that causes the toy cars to move around in a pattern-like controlled choreography, while the code's current threat is broadcasted through loudspeakers.

Wilson (2010:191) understands *PoliceState* as a critical response taking place in the context of the public debate around the FBI's implementation of *Carnivore* to electronically monitor the communications of large numbers of American citizens. The author sustains that the growth of surveillance technologies has increased our capability to track both objects and persons. Therefore, the possibility to maintain databases just to track objects from their manufacture until being disposable, coined as The Internet of Things, might constitute a growing nightmare. Wilson states that the artists obvious concern when dealing with subjects such as the increase of video surveillance in public spaces, of snooping on communication networks, and the use of smart-card/RFID tracking technologies to track tagged objects, is the loss of privacy and identity (Wilson 2010:183).

Fig. 42: CodeZebra (Diamond 2002).

CodeZebra, a project created in 2002 by Sara Diamond and the collective *Code Zebra Inc.,* comprises a visual chat and threaded discussion software, performance

events, and the creation of responsive fabric fashion designs (Banff 2004). The project is categorized in the Festival's literature under the theme *Content Management,* and further tagged as *Communities, Streaming Media, Chatting,* and *Software* project; described as a new kind of chat in a visual 3-D space, using animal print metaphors in its design and functionality. *CodeZebra* is presented as a Chat-software at the vanguard of advanced chat technology. It addresses a weakness in existing Chats that becomes apparent when a large number of people begin to interact. This problem is solved by providing a three-dimensional visual guide to what is being said, by whom and with which emotional tone, and by creating a dynamic visual depiction of the underlying associations between related topics and issues (Diamond 2003).

CodeZebra was originally built to facilitate debates between artists and scientists, but also promotes public performances in the physical world, themed club events with DJ's playing, audiences chatting, and parades displaying *CodeZebra* responsive fabrics, costumes and fashions derived from patterns created in the chat software (Banff 2004).

They Rule, is a piece by Josh On and the collective *Futurefarmers* from 2001, and is presented in the festival literature as a Web project under the theme *The Political Aspects of Data Knitting.* Further tagging includes the following keywords: *Networks, Corporations, Information, Visualization, Power,* and *Activism*. *They Rule* was also part of *The Whitney Biennial 2002 Net Art Selection,* whose participating artists and projects were also included in this study's data, and will be described further in this text.

They Rule is presented as a launchpad to investigate corporate power relationships in the United States. The piece allows the users to browse through a constellation of the most powerful companies in the world and explore the relationships between their power structures as depicted in the connections inside and between each board of directors. The Website visualizes these connections graphically in a dynamic browsable archive, where users can find the most influential corporations and add data to the database of the project allowing other users to react (Brouwer, Mulder & Charlton 2003:135).

The iconography of the piece is tightly connected with the images we have from the corporate world, where men and women in suits carry their briefcases. each briefcase is relative and reflects the number of boards in which a CEO seats on. By clicking a briefcase one accesses its content, as it 'carries' relevant data about its subject and its connections. The authors state that *They Rule* employs the features of networked technologies, such as dynamic mapping, hyperlinking, and instant searches, to create its own subnetworks of power systems. It is also understood that the piece invokes C. Wright Mills' book *The Power Elite* (1956), which documented the interconnections among the most powerful people in the US (Paul 2002).

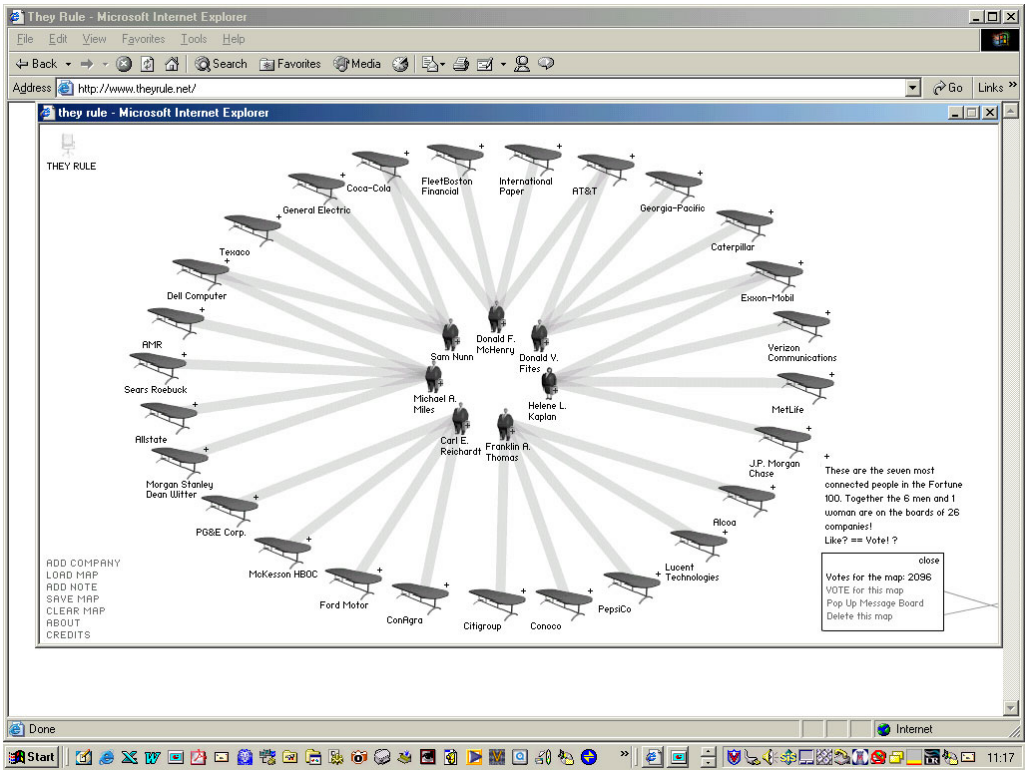

Fig. 43: They Rule (On & Futurefarmers 2001).

They Rule is presented as fulfilling the promise of the Internet as a democratizing medium. It appears as the place from which the data necessary to reveal the connections of these and other power structures can be easily retrieved and made operative through information and knowledge. *They Rule* is referred by Sack (2006) as an example of a visualization of the *Body Politics* in a mediated space, as a way to see both the *demos* and the tyrants that we can easily see and feel for instance in the

physical context of a crowd. He suggests that discovering or inventing a visual form to show the *Body Politics* to itself is the outstanding problem of artistic research and information visualization (Sack 2006). Wright (2004) refers to *They Rule* as a project where operations such as networking and sampling are applied in new modes of expression like data visualization, and quotes Manovich's notion about this kind of work replacing older forms of authored representation by giving us the tools to objectively analyze raw data and deduce the necessary conclusions.

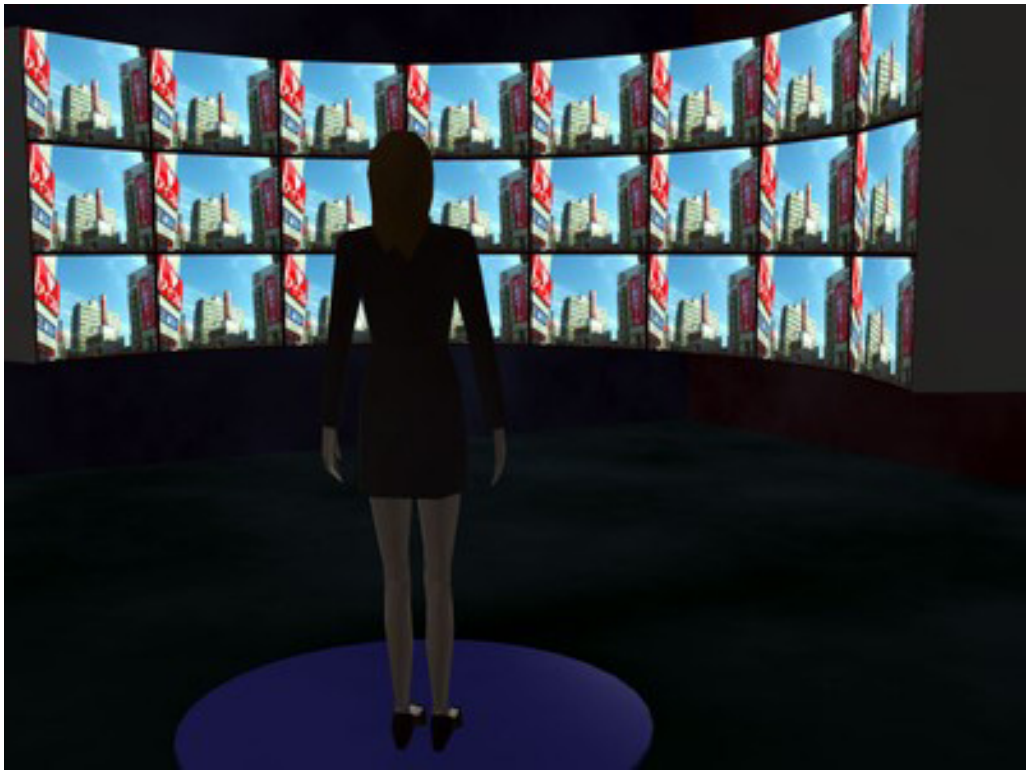

Fig. 44: 100.000 Streets (Mul 2002).

100.000 Streets, made by Geert Mul in 2002, is categorized as the *World as Archive* and tagged as *Cities, Video, Metadata* and *Globalization.* The Festival's literature describes it as an exploration of the visual overlap of cities all over the world, where visitors to the Installation are presented with a tour throughout a kaleidoscopic fan of urban images retrieved from the Internet, and selected because of their visual quality by a specially designed, visually intelligent software (Mul 2003) (Brouwer, Mulder & Charlton 2003).

The project uses for the visual analysis a custom software called *No-Ta-Ti-On* where images are sorted by parameters of content and form, in order to establish patterns in the project's database. Through the use of the Internet as an easily accessible archive of randomly organized audio and visual data, the project shows the way how digital applications of data clustering allow for dynamic combinations and relations that generate information otherwise unimaginable, as the ones of the global city (Mul 2003) (Brouwer, Mulder & Charlton 2003:176).

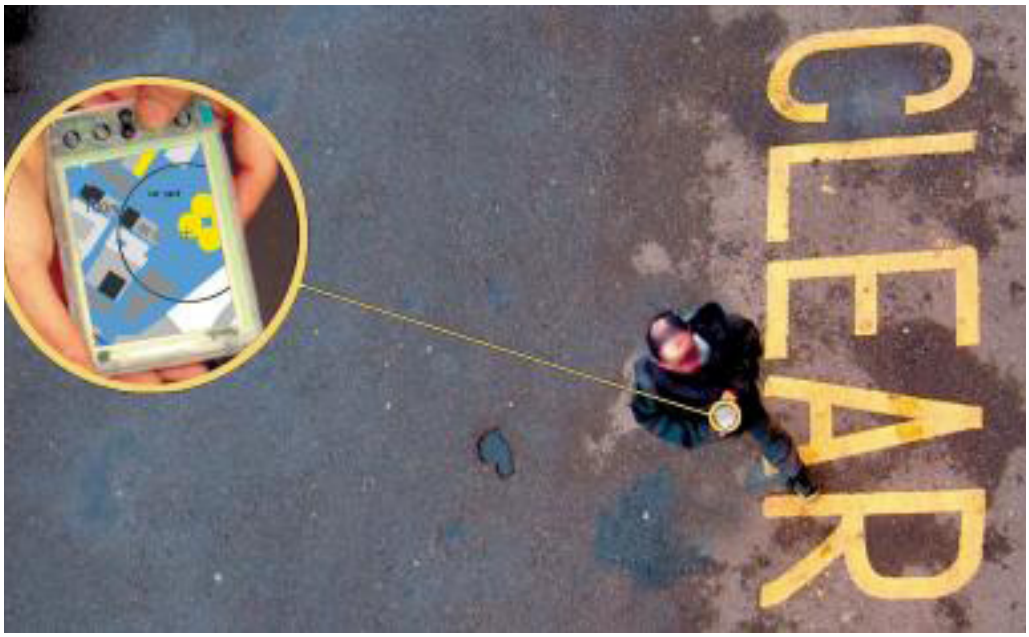

Fig. 45: Can You See Me Now? (Blast Theory 2001).

Can You See Me Now? was created in 2001 by the collective *Blast Theory,* with the participation of the media lab, *Mixed Reality Lab,* and the research institute, *Equator Interdisciplinary Research Collaboration.* The project is categorized in the Festival's literature under the theme *The Dynamics of the Living Archive,* and further tagged as *Games, Avatars, Mapping, Mixed Reality, Cities, Participation,* and *Theater* (Blast Theory 2003).

That project is described as a modern variation of a board game called *Scotland Yard,* taking place live in the streets of Rotterdam. It incorporates the latest communication technologies and is played simultaneously online and in the streets during a period of five days. While players in this mixed-reality game log on its Website

online, their avatars are chased by *Blast Theory* pawns in the real world until they're intercepted. The mapped chase is documented with photographs collected to be archived in the project's database (Brouwer, Mulder & Charlton 2003:83). In *Can You See Me Now?* there's a conflation between the physical and the virtual environments condensed into a living archive whose reconstruction can be seen and heard afterwards on the project's Website (Brouwer, Mulder & Charlton 2003:84).

Kate Richards (2003) states that a decisive feature of *Blast Theory*'s project is the ability to extend user and audience affect outside the game. Therefore rather than delimiting our consciousness to the stereotypical and the virtual, the gameplay pushes us to understand aspects of ourselves, our communities and social responsibility. She mentions *Ars Electronica* for awarding Blast Theory its utmost important award, the Golden Nica, while criticizing the institution for awarding commercial, and apolitical projects in the past. Yvette van Nierop (2002) refers that in *Can You See Me Now?* the data is experienced as personal, because even if the human aspects in the game are translated to digital data and look impersonal, the players experience is not detached from the game. The excitement purely results from the imagination of the players that is enough to create the physical result of adrenaline floating through the body when the representative icon is on the verge of being caught. The author indicates that the project shows the flexibility with which human imagination can either represent itself in data or identify itself with data. Hence, as far as human imagination is concerned, the digital extension of reality is just another realm for the projection and identification of a sense of self (van Nierop 2002).

Fig. 46: Can You See Me Now? (Blast Theory 2001).

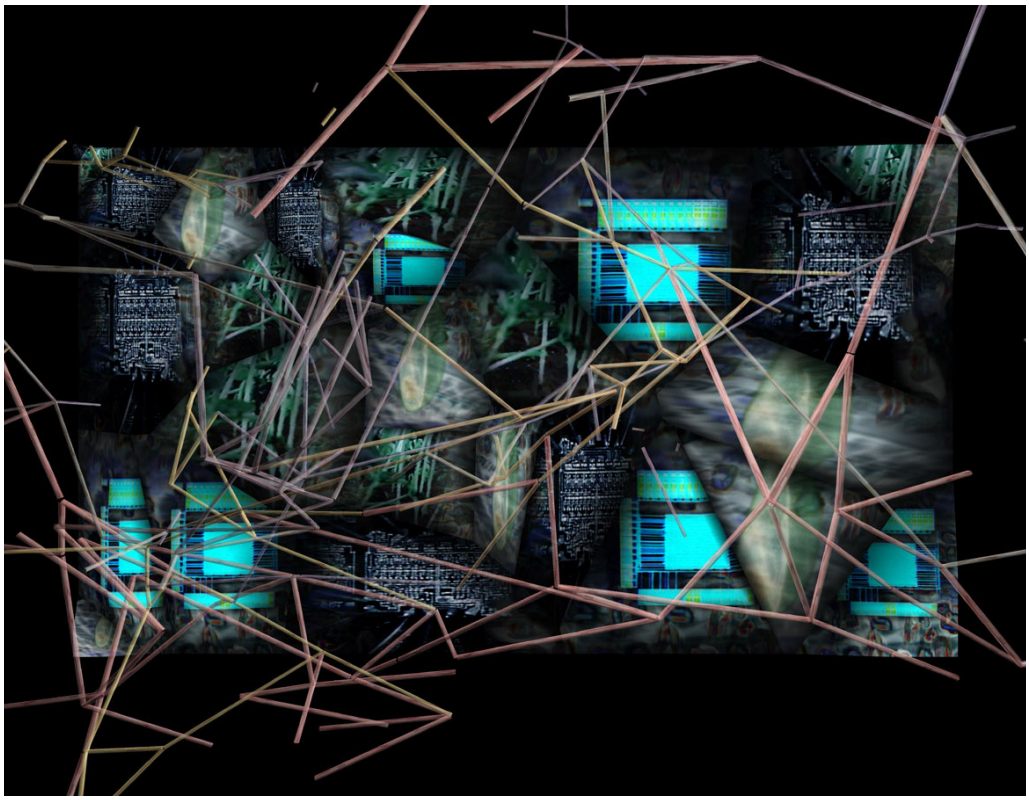

Fig. 47: Web of Life (Shaw et al. 2002).

Web of Life, was created in 2002 by Jeffrey Shaw, Michael Gleich, Bernd Lintermann, and Andreas Kratky. The project, tagged in the Festival's literature as *Memory, Networks, Stereography,* and *High Bandwidth*, is described as organizing images and sounds retrieved from a database of computer graphics and video images, in an organic network through following the personal pattern of the lines of the user's hand. The interdisciplinary nature of the project is patent in the exploration of the possibilities of a 'living network' by means of a book, a Website and five networked Installation pieces (Brouwer, Mulder & Charlton 2003:138).

The project's Website states that the artwork allows persons to interactively influence the performance of an audiovisual environment. This is made possible by their imparting to it the unique patterns of their individual hand lines, thus giving symbolic and experiential expression to the action of connecting oneself to an emergent network of relations. This audiovisual environment is thus formed by an immersive

conjunction of projected three-dimensional computer graphic and video images, together with a fully spatialized acoustic experience and a specially conceived architectural surrounding. The interaction is consequently effected through a hand-scanning user interface (Gleich & Shaw 2002).

The *Web of Life* project works as a network of four distributed Installation pieces designed to itinerate around the world and one large-scale environment located permanently at the ZKM-Center for Media Arts in Karlsruhe, Germany. If a user interacted with any of the Installation pieces, that would affect the audiovisual behavior of the all network (Gleich & Shaw 2002).

Globe-Jungle Project was created by Yasuhiro Suzuki in 2001, and is tagged in the Website's literature as *Play, Video, Memory,* and *Cinematography.* The project is presented as a wake-up call to physical exercise in a society in which the pervasiveness of technology makes people increasingly sedentary. The project brings back memories of the pleasure of playing outside through the use in the installation of a 'Globe-Jungle', which is a circular climbing frame very popular in the last decades in Japan.

The interactive Installation is part of a larger project in Japan for redesigning city parks, and while promoting contacts between the young and the old, uses the energy of the daytime playing children to stimulate the memory and the senses of visitors at night. During the day a couple of video cameras record a daytime archive of video images of the children playing and their surroundings through their perspective from inside the globe. At night, the visitors can access the projected images on the globe by rotating the structure whose bars act like a reflecting surface, or a screen, in a cinematic-like afterimage illusion (Brouwer, Mulder & Charlton 2003:51).

The project's literature states that a nostalgic illusion is created where the present and past of the visitor, day and night of the surroundings, and the inside and outside of the playground, fade into each other. The echoes from the past only get some meaning by the motion that goes on in the present: the faster the globe spins, the better we see our past, until the globe is as round as our image of the Earth (Brouwer, Mulder & Charlton 2003:52).

Fig. 48: Globe-Jungle Project (Suzuki 2001).

The project's presentation abstract at the *ISEA 2002 Exhibition* in Nagoya, states that interactivity with computers or sensors is not important for this artwork, because it is through the action of turning the *Globe Jungle* that the viewer can enjoy how the images appear and flicker in a onetime experience accompanied by a physical sensation. It infers that the meeting point with the viewer's own childhood memories created by the act of turning the globe, acts as an emergent space where technological recording and memory are linked and naturally fused together (Suzuki 2002).

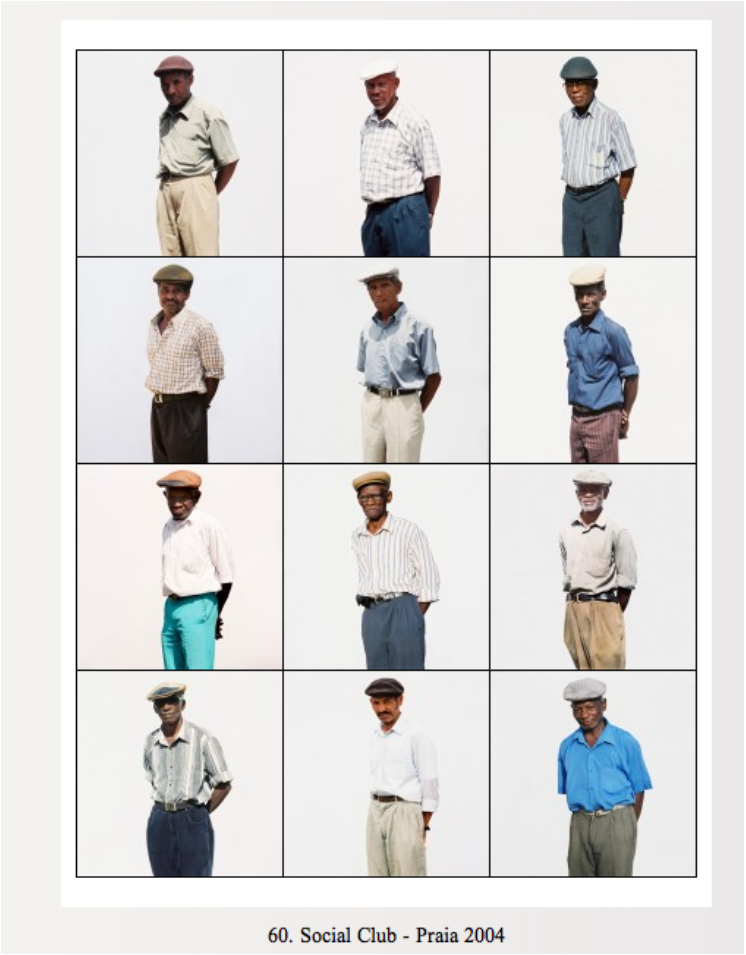

Fig. 49: Exactitudes (Versluis & Uyttenbroek 1994).

Exactitudes, by Ari Versluis, a photographer, and Ellie Uyttenbroek, an artist/profiler, is a photographic project in progress since 1994. The Festival's literature categorizes the project under the theme *The World as Archive,* and further tags it as *Photography, Portraits, Typology,* and *Clothing.* The description text explains that *Exactitudes* is a contraction of the words 'exact' and 'attitude', and that the photographic project systematically documents groups of identities, in which the heterogenous, multicultural street scene has been a major source of inspiration, in the sense that the people portrayed have literally been 'picked up from the street'. The project is in fact a photographic archive that shows typologies in the forms of photographs grouped together and in which the registration of subjects in an identical framework

provides an anthropological record of people's attempts to distinguish themselves from others by assuming a group identity (Versluis & Uyttenbroek 2003).

In Brouwer, Mulder & Charlton (2003:42) is stated that *Exactitudes* can be regarded as a sociological study of multicultural society, and that the project is reminiscent of August Sander's *Citizens of the Twentieth Century.* Sander was a German photographer who, during the 1920s and 1930s, attempted to create a panoramic view of German society, documenting the later days of the *Republic of Weimar* and the rise of the *Third Reich.* The author further states that the project attempts to expose the cultural signs that identify a certain subculture and trace their common denominator, as if mankind was a mere collection of data that could be described through metadata (Brouwer, Mulder & Charlton 2003:44).

Sandra Fauconnier (2003) compares *Exactitudes* methodology to the work of German photographers Bernd and Hilla Becher, that since the late 1950s, have photographed—portrayed—examples of building typologies. They were mostly interested in industrial buildings such as gas holders, water tanks and silos, but they also paid close attention to the typical framework houses of the Siegen region of Germany. Furthermore, commenting on *Exactitudes* and Ingo Günther's *Worldprocessor,* that author states that the pseudo-scientific research approach is an important aspect. In her opinion, "both works confront us with the fact that the choice and the representation of data, transforming these data into information, is a political act", and that "our convictions about our personal identity and uniqueness (*Exactitudes*) and our overall world view (*Worldprocessor*) emerge, to a certain extent, from a mediatized illusion." (Fauconnier 2003)

Zgodlocator, created by Herwig Weiser between 1998 and 2002, is tagged in the Festival's literature as *Hardware, Noise, Transformation, Magnetism,* and *Analog Data. Zgodlocator* is described as a project in which information streams form alchemistic compounds with hard matter. Hundreds of computer hard disks have been ground to magnetically sensitive grit that visitors can manipulate. This piece, controlled by a number of buttons, produces strong magnetic fields that turn the grit into freakish landscapes and patterns.

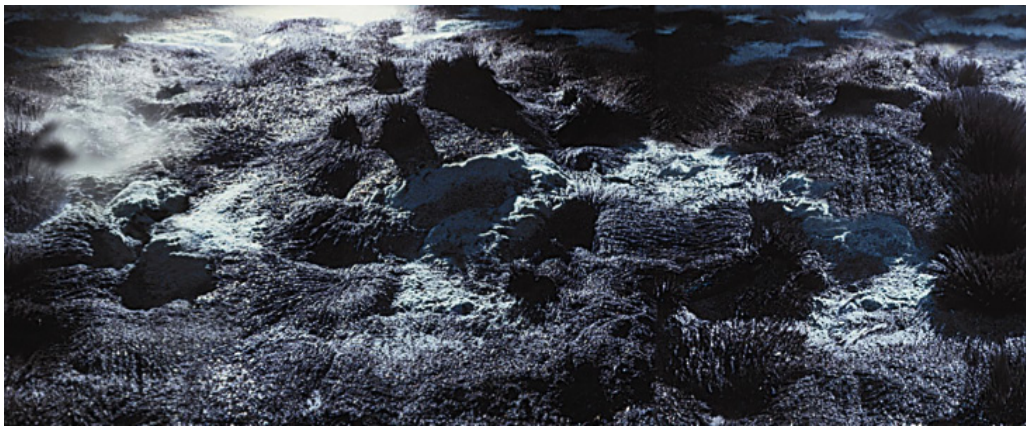

Fig. 50: Zgodlocator a (Weiser 1998-2002).

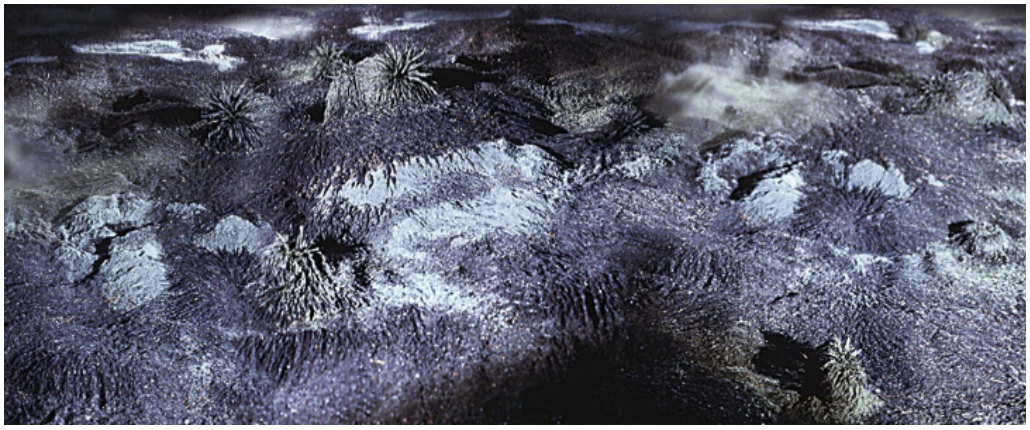

Fig. 51: Zgodlocator b (Weiser 1998-2002).

In Brouwer, Mulder & Charlton (2003:47) is stated that the Installation focus lays on the dynamic aspects of the computer, in detriment of the computer as a storage medium for text or images. In this project the computer is used as a tool that has a dynamic nature and a very short and fast changing memory. They emphasize the continuous reprocessing of information and the reconstructing of dynamic archives that are constantly changing, as the users actively use them and because the material is also organized by the computer itself. Finnaly they believe that it is magnetism that in *Zgodlocator* becomes the dynamic container for storing, manipulating, and processing information in its most raw and plastic form, that is, matter (Brouwer, Mulder & Charlton 2003:47).

Fig. 52: Poetry Machine_1.5 (Link 2001).

Poetry Machine_1.5, made by David Link in 2001, is an interactive Installation tagged in the Festival's literature as *Poetry, Association, Semantic Networks, Linguistics,* and *Serendipity.* David Link (2001) explains in his Website that *Poetry Machine* consists of a central program that reads and writes texts, a BOT (build-operate-transfer) system that automatically retrieves information from the Internet, a Chat client that communicates with people in Chat-Rooms and a local display that shows the current network structures in the database.

The project's presentation text in the Website of the Festival describes a room with a keyboard whose keys seem to move by themselves, a flood of words appearing in a wall, and a mechanical sounding voice reading them aloud. When a person approaches the mysterious keyboard, sensors pick up her movements and disrupt the machine's flow of words rhythm. It stops the keys and expects the person to input

some words in order to start forming associations from the typed words (Brouwer, Mulder & Charlton 2003:162).

The Installation project starts from zero, as to say that in the beginning the *Poetry Machine_1.5*'s database is empty, without words and without connection between them. The project has a built-in search engine that retrieves texts from the Internet and processes them with a text analysis program. The resulting analysis provides data in order to the database to form its own lexicon of semantic networks, defining the meaning of the words as a cluster of links to other words. The stronger the connection between words found by the database, the stronger their link and the greater their chance to stand out from the flood of other words (Brouwer, Mulder & Charlton 2003:163).

Poetry Machine_1.5 activates its semantic network as soon as someone types something on its keyboard. If the word is not yet known to the system, the program sends out autonomous 'bots' to the web, seen on a lateral plasma screen, to collect texts in which the word occurs. The project is thus a conversation between its autonomous database and a hypothetical user's input. As Brouwer, Mulder & Charlton (2003) suggest, this form of interaction between machine, words and human text create a new *écriture automatique,* or updates that same Surrealist practice, because language is no longer the exclusive domain of human conscient thought but also belongs to the internal logic of computers.

Frieling (2004) refers to David Link's *Poetry Machine 1.0* iteration, along with Bradford Paleys's *TextArc* (2002) and Ben Fry's *Valence* (1999-2002), when he speaks about dynamic text-mapping objects. Ben Fry's *Valence*, was shown at *The Whitney Biennial 2002 Net Art Selection Exhibition,* held in 2002, along with a selection of nine other projects. Amongst them, *They Rule,* by Josh On and *Futurefarmers,* a part of *DEAF03 From Wunderkammer to Meta-Data Exhibition* (2003), and *1:1* by Lisa Jevbratt (1999-2002), a part of *Database Imaginary Exhibition at Banff* (2004-2005) were already referred and described as data included in the study's database. The thread of coincident artifacts among the aforementioned events, drove the process of data sampling in this study to explore *The Whitney Biennial 2002 Net Art Selection* as a source of data samples.

Christiane Paul, Adjunct Curator of *New Media Arts* at *The Whitney Museum* was responsible for the *Biennial Net Art Selection.* This *Selection,* a branch of *The Whitney 2002 Biennial Exhibition,* was presented as a compilation of Internet-based art that testifies to the variety of forms that Net Art can take and to the multiplicity of themes that emerged over the years. Among the various forms referred in the presentation text, it is pertinent for this study the one referred as *Networked Software Art* — art that resides on a local computer but culls data from the Internet. from the most prominent themes in Net Art, Data Visualization and Mapping, and Database Aesthetics (Paul 2002) are the ones that have been providing structure for the investigation.

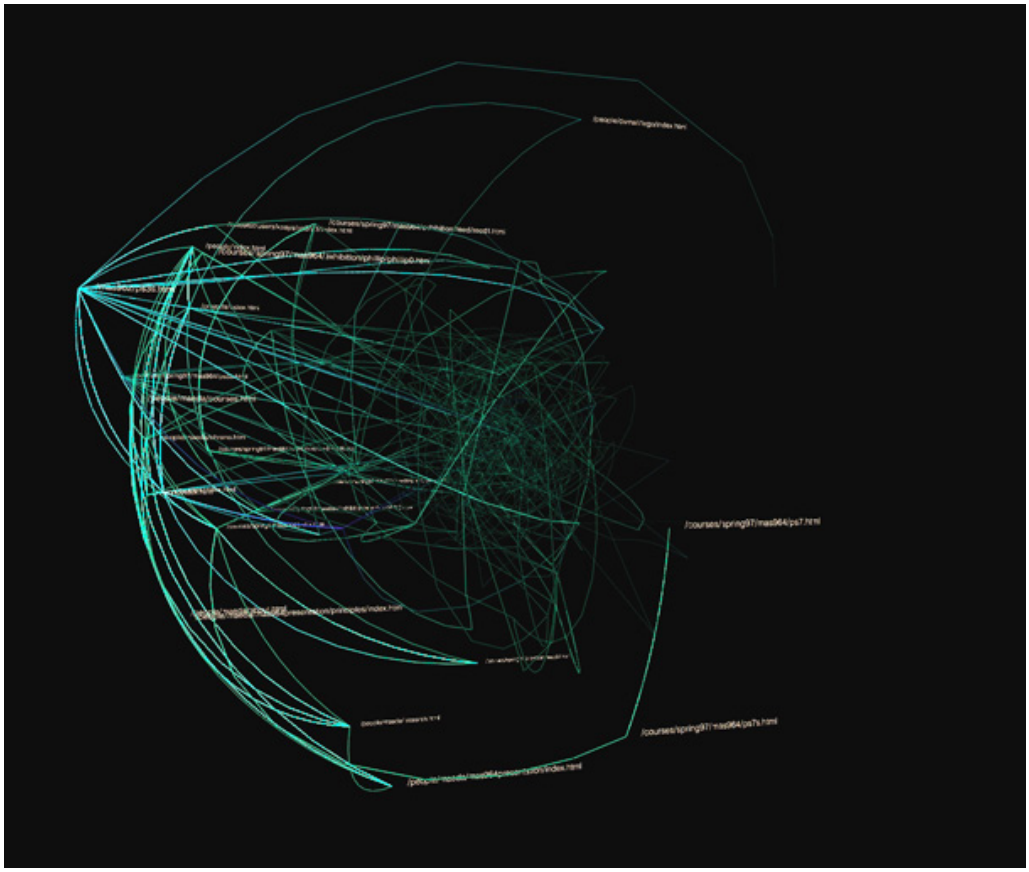

Fig. 53: Valence (Fry 1999-2002).

Valence, by Ben Fry, 1999-2002, is described in the exhibition's literature as a data visualization software that creates interesting visual constructions from large bodies

of information, thus allowing us to understand them in new ways. *Valence* is contextualized as a dynamic counterpoint to the static methods for representing data, like charting, graphing and sorting, that have been established over the centuries. This project points out that the dynamic representation of large datasets has become a field of scientific and aesthetic research. *Valence*'s power, already implied in its title, lies in its capacity to visualize almost anything, from the contents of a book to a Website's traffic, or for comparing different texts or data sources (Paul 2002). The mentioned text states that the resulting visualization responds to new data by changing over time and, instead of providing statistical information, feeds a qualitative feel for the perturbations in the data, and builds up a self-evolving map driven by the generated patterns.

For the *2002 Whitney Biennial, Valence* is presented as *Genome Valence,* since it visualizes the biological data used to compare the genomes of a human being, a fruit-fly and a mouse. The piece is a visual representation of the *BLAST* algorithm, which is used for genome searches. The text states that the project's main premise is that the best way to understand a large body of information is to provide a feel for general trends and anomalies in the data by presenting a qualitative slice of the information's structure. *Valence* is presented as an aesthetic "context provider" that sets up relationships between data elements, that previously were less obvious or existed under the surface of what we usually perceive (Paul 2007:178).

In the project's Website, Fry underlines his interest in building up systems that create visual constructions for large bodies of information beyond the traditional static methods described in Tufte's work, stating that much interesting work remains in finding models and representations for examining dynamic sources of data, or very large datasets.

Frieling (2004) refers to Valence as software that creates a program that brings algorithm and narration into a strikingly new relationship in which a kind of textual sculpture is created. He compares *Valence* with *Web Stalker* (1997), by the *I/O/D* artists' collective. This last project is probably the most frequently quoted mapping project in Internet Art, because the alternative browser can present the static link structure of any website abstractly, in order to create an image that can be compared

with other structures. Like in *Valence,* the correlations can be recognized at a glance. Frieling suggests that Fry destroys the linearity of the text to construct a different textual form, that works like a visual 'signature' for a text, and contributes to the information condensation process.

Wilson (2010) suggests that *Valence* proves that even art and literature can be subjected to meta-analysis through visualization: when the words in a book stream into the program, an animated multilayered orbital diagram is constantly readjusted; related words cluster near each other, and the connecting clusters show additional relationships. This author then says that if predictions are true, at some point in the future, every corner of life will be captured in databases. Still according to Wilson, it is the role of the artists to help addressing the challenge of how to make use of this data and how to think about its negative aspects and its dangers. Moreover, he adds that, even more importantly, artists will indicate the ways to move beyond utility, transforming data-derived information into novel aesthetic forms (Wilson 2010:184).

Stalbaum (2004a) refers to Paul's (2007:178) description of *Valence* as a clearly highlight of the notion of beauty, revealing form, and making cognizable, as should be the goal of data visualization art works dealing with large datasets. Stalbaum's article does so when discussing the cultural conflation of the definitions of the terms "beauty" and "sublime", referred as going beyond the cultural interchange he identifies between the terms "information" and "data". That same author states that as information and data are sometimes interchangeable terms in common usage—being data often taken as a synonym of information—, the meanings of beauty and sublime are today similarly conflated (Stalbaum 2004). Stalbaum's places this reasoning in the context of database practices in art, and refers to a Lev Manovich (2002) observation about the aesthetics of *Data Visualization* practice, in which he critiques contemporary data visualization practice in art as a pursuit of beauty in the transformation (or processing) of large datasets into the visual field, calling it the "Anti-Sublime" aesthetic (Stalbaum 2004a).

Stalbaum (2004a) states that beauty in data visualization is opposed to the sublime, as beauty is regarded as the pursuit of clarity, balance and transparent form. A simi-

lar quest should lead all projects of data visualization, for the sake of data clarity and understanding. The sublime would then become the condition under which the data overwhelms its viewer, and the viewer's senses are mobilized in a special kind of cognition to which there are many names: intuition, anticipation, instinct, or a sixth sense. The author points out that, in terms of how we interpret the art practices engaged in data visualization, beauty as opposed to the sublime is the most critical contemporary interpretive framework in which such art may be evaluated aesthetically. He also mentions the important divide between facilitating the understanding of data through beauty, which is an inherent role of data visualization, and the access and processing of raw unmediated data by the users. This would indeed ask from the communities' a conscious effort to take democratic control over the interpretation of their own data, according to the suggestion of the sublime analysis. Stalbaum (ibid.) also draws attention to the important role that the artists may play in that regard, acting more as guides in data exploration than as experts in data visualization.

Going back to the formal definitions of "data" and "information", Stalbaum establishes a parallel to the issues raised by the beauty and the sublime. He highlights the *Data Visualization* practice as bound to the transition of representations between states of being data, and states of being information. Roughly, this means visualizing data to convey information, which Stalbaum's affirms as congruent with Paul's discussion of Fry's work *Valence* and the overall discussion of database practice, which implies data visualization's pursuit of beauty. With this reasoning, the author understands the pursuit of information as being the pursuit of the beautiful, and the pursuit of data as being the pursuit of the sublime; the former implying a struggle for understanding, the later an impulse for exploration, including the collection and generation of new data (Stalbaum 2004a).

Whitelaw (2007) makes a critical analysis of *New Media Art* working with data interfaces and visualization, defined as data practice or data art, from a similar perspective that separates information and data. The author argues that data art often turns away from information in an attempt to present the data itself (Whitelaw 2007). Like Stalbaum, Whitelaw supports the idea of interchangeability between "data" and "information", particularly relating to the way both terms are used in

art. There seems to prevail some kind of blurring that obscures the fundamental distinction and the main relation between both terms. Whitelaw exemplifies with Sack's (2006) use of the phrase "data visualization" on his paper on "Aesthetics of Information Visualization", Simanowski's (2005 qtd *in* Whitelaw 2007) uses "data" in general but interposes "information" without any explanation, and Manovich's analysis of "data-art" occurs in the context of a wider project on "info-aesthetics".

Whitelaw brings forward the notion of data from empirical Science, as a set of blank, abstract, and meaningless measurements extracted from the flux of the real, that only when contextualized and analyzed by an observer yield information or meaning. In the article written by Tan et al. (2006) about data mining, that same task is described "as discovering useful information in large data repositories", while Hansen & Rubin (2001) consider an artists' approach describing *The Listening Post* (2002-2005) as "exploring the information hidden in data". Both concepts of data and information are though presented as converse, and two sides of the same thing: data being the raw material of information, its substrate; information being the meaning derived from data in a particular context (Whitelaw 2007).

While this separation is coherent with Stalbaum's argument for data exploration, Whitelaw states that data art involves a practical exploration of data's potential uses and meanings. In this sense data literally offers us images, figures, and data in itself. Being so, it pulls us away from information, from the well-formed messages that dominate our experience of digital media, and by directing us instead towards the data, it opens space for potential, and for the reconstruction of information (Whitelaw 2007).

Besides the artifacts *Valence* (1999-2002) and *All Streets* (2008), both part of this study's data, it is also worth to note Ben Fry's contribution to bring the artists and designers' communities to a programming environment. Along with his colleague C.E.B. Reas developed *Processing,* a computer programming language optimized for artistic and design experimentation. Wilson (2010:160) quotes Reas as urging artists to become involved in programming because of its critical role in technology-based culture.

The aforementioned *All Streets,* 2008, is a piece that represents in a unique image with 26 million individual road segments all the streets in the lower 48 United States. As stated in the project Website's, in spite that no other features such as outlines or geographic features have been added to the image, they still emerge as roads avoiding mountains, and sparse areas conveying low population. Usually, when we think about maps, their most distinctive feature is the outline, the many frontiers that add up to shape entire continents and ultimately the difference between land and water. *All Streets* is a structural map whose shape is rendered by every channel navigating the territory, in a vascular depiction of artificial nature with different densities that have intrinsic beauty.

About *All Streets,* Ben Fry states that although there is nothing particularly "genial" about the piece, as it is mostly a matter of collecting the data and creating an image, it still is one of those cases where even in a (relatively) raw format, the data is in itself quite striking.

Fig. 54: All Streets (Fry 2008).

All Streets offers evidence of how the streets in a territory can provide a vivid representation of a nation's geography with an impressive detail. It is also remarkable to find out to what extent the nature of a country is revealed by its artificial morphing.

All Streets acts as a direct account of the end of the unknown in a specific territory, that all as been already traveled and that there is less to be explored or discovered (Cruz 2010).

Advancing through *The Whitney Biennial 2002 Net Art Selection* participant projects, *EARTH,* made by John Klima in 2001, is presented in the exhibition as the *Unique EARTH* projection. This happens to be the final piece of the *EARTH* system, and took the shape of an Installation piece with two user stations running the networked software, and with an overview projection on a translucent latex weather balloon (Paul 2002).

The *Unique EARTH* overview projection on the balloon shows the whole Earth from the point of view of the outer layer that comprises the *LANDSAT-7* satellite imagery of the surface of our planet. This projection can be rotated using a trackball input device located at the user stations.

The exhibition literature describes *EARTH* as a unique geo-spatial visualization system, representing a broad range of information about our planet in multiple data layers. The software positions real-time data culled from the Internet on a three-dimensional model of the earth. Klima states that the *EARTH* project has numerous levels of viewer/collector participation: the viewers are able to travel from layer to layer by zooming and retrieving imagery and data from specific regions, while the software represents all the online viewers by positioning satellites, and indicates a 'best guess', as to what the viewer's actual location is in the planet. He points out that it is the overview of the complete system as a characteristic—he coins it the "Big Brother" surveillance in a benign informational universe—that reminds us of the often more sinister nature of the techno-informational landscape developing in the real world (Klima 2002).

Paul (2007:185) refers to *EARTH* as being a project about the tracking of the information flows, focused on real-time publicly accessible data and the aesthetics of representation. She states that *EARTH* is an aesthetic investigation of the world as it currently exists 'in data', exploring imagery that purportedly depicts reality and

at the same time unveils the underlying characteristics of that reality as a mediated, processed representation.

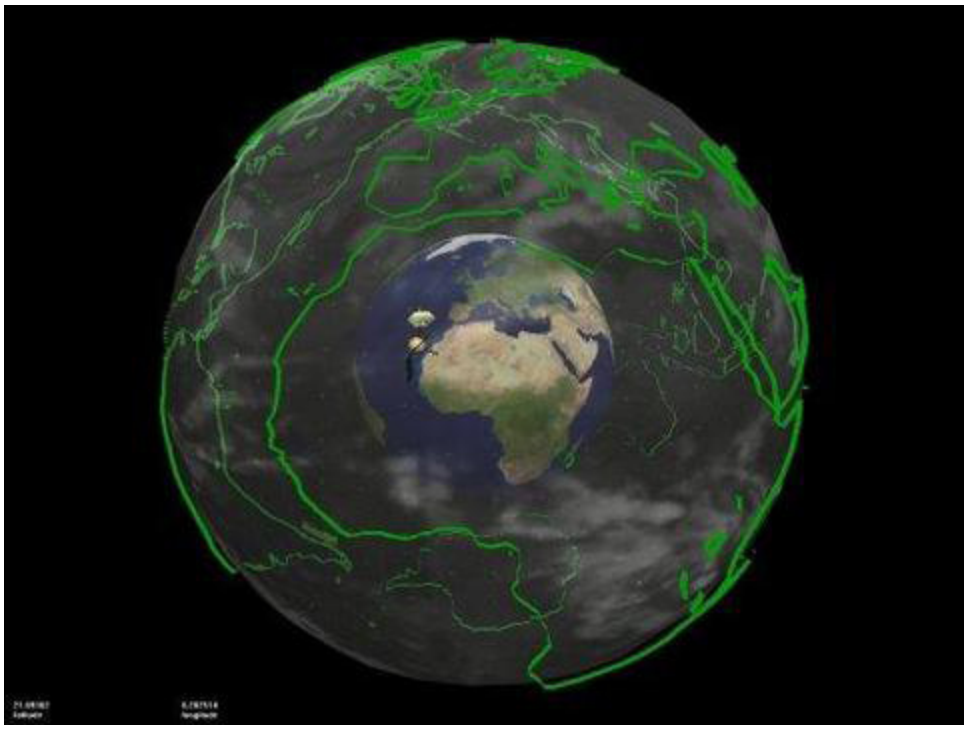

Fig. 55: EARTH (Klima 2001).

Frieling (2004) refers to John Klima's *EARTH* as one of four mapping strategies where data is used to transform objects, commenting that the project offers an impressive 3D zoom function for the geography of the USA, but still being just an elaborate design innovation for navigation on a geographical map, which also unquestioningly accepts the problematical aspect of data-mining in its networked variant as a surveillance function.

The dynamic mapping of real-time data streams (Paul 2007:99) brings the study to include another John Klima's project in its data. *ecosystm,* from 2000, is described in its Webpage as a real-time representation of the global volatility and fluctuations of currency, the leading global market indexes, and the up-to-the-minute weather report from *JFK* airport. It was commissioned by an investment company based in New York, *Zurich Capital Markets,* and re-purposes data that *ZCM* uses every day, to drive a 3-D environmental simulation that users can explore.

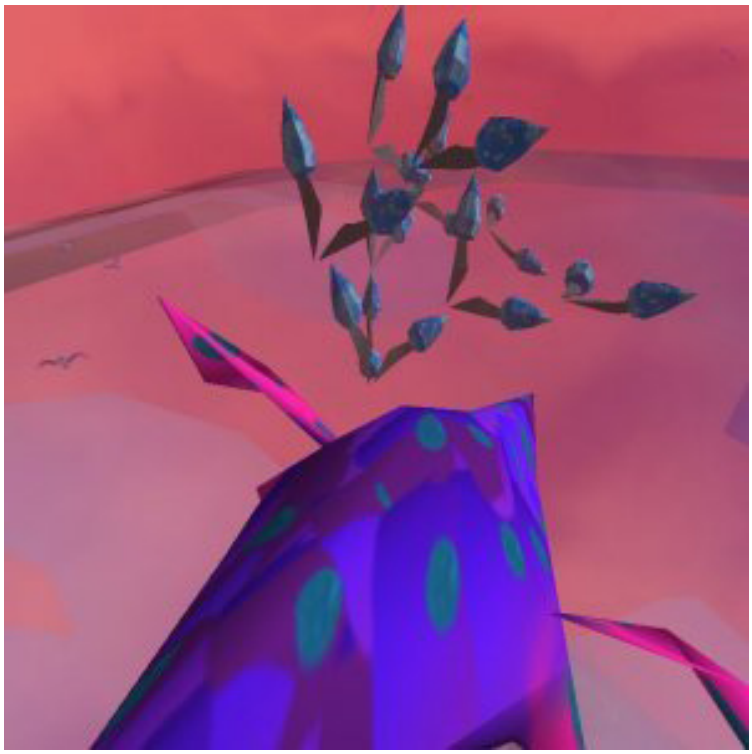

Fig. 56: ecosystm (Klima 2000).

ecosystm portrays flocks of "birds", each flock representing a country's currency, and branching "tree" structures, each tree representing a country's leading market index. Both trees and flocks grow or decline according to index or currency fluctuations. Currency volatility, measured daily against yearly average is also an important variable in *ecosystm*, determining the flock's mood and behavior according to the available space, neighboring flocks and surrounding index flora. The weather in *ecosystm* mirrors *JFK*'s airport atmospheric data.

Paul (2007:183-184) refers to *ecosystm* as a simulation in the original sense where the functioning of the financial market is visualized through the functioning of another system. That visible system may appear either as a serene and beautiful world experienced from a majestically gliding bird or as an aggressive and eerily threatening environment, depending on the world's currency fluctuation 'behaviour'.

As previously stated, Paul (2007:99-100) mentions *ecosystm* in proximity of the project *Map of the Market,* developed by Martin Wattenberg's in 1998, to the piece S*tock*

Market Skirt made by Nancy Paterson in the same year, and to the project *Synthia,* created by Lynn Hershman in 2000, as all projects visualize a similar dataset—stock market or financial data, in distinctly different ways. According to Paul, each visualization creates its own contextual framework for perceiving the data flux, and it is an indication of how much "database aesthetics" depends on the algorithmic representation of data.

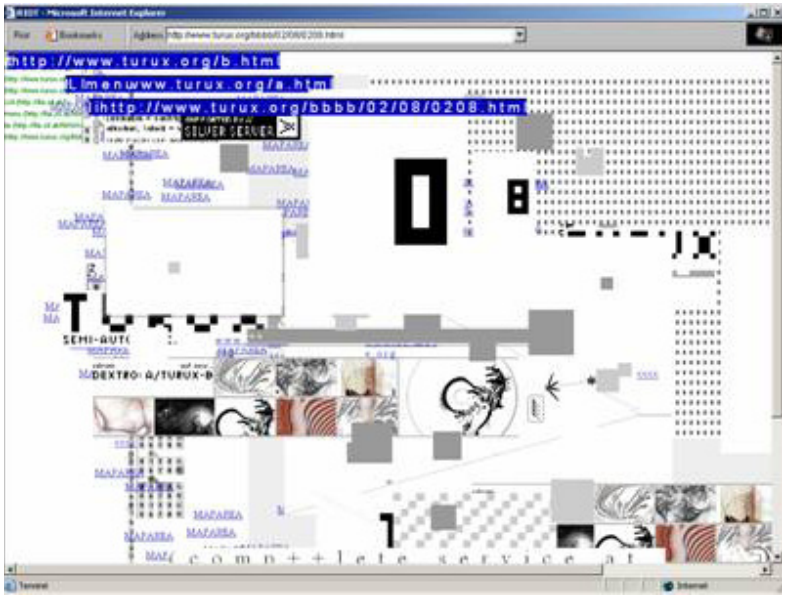

Fig. 57: Riot (Napier 1999).

Riot, presented by Mark Napier in 1999, is described as an alternative, "cross-content" Web browser that, like its real-world namesake, disrupts the accepted rules of property and exposes the fragility of territorial boundaries on the Web. The project was shown at *The Whitney Biennial* as a website on a computer screen, the software working as a blender mixing Web pages from separate domains into a browser window. It has been said that *Riot* is a software "melting pot" inspired by the clashing of classes and ideologies at the *Lower East Side* in *New York*. In fact *Riot* combines contents from opposite poles of the Web, such as for instance the official *Vatican Website* with *Hell.com* or *Microsoft.com* with the hacker quarterly *2600.org,* and therefore merges contents and ideologies, dissolves territorial conventions, and creates a composite based on a form of controlled randomness that is partially the user's input and partially the artist's parameters.

Riot's premise brings forward the differences between reality and virtuality in a sense that on the Internet the physical space and objects are replaced with experiences produced by hardware and software, data and instructions. As it is already mentioned on the project's description, the same information can be, and is recycled and reproduced in seemingly endless ways and is distributed in ever-shifting contexts. Nevertheless, the alternative space of the Net ultimately resists, while our traditional, physical models of ownership, Copyright and branding persists. As a semi-random content mixer *Riot* questions the assumption that "content is king" by undermining and separating content, and treating it as raw material or data for its aesthetic experiments.

Napier (2001) states that his projects are software interfaces developed in JavaScript, Java, and DHTML, to be viewed through a Web browser online and built to be interactive experiences that respond to an input from the user. He explains that in *Riot* and *The Schredder* (1998), where the user participation is critical, he employed CGI scripts to rewrite the rules of ownership and territory that the browser imposes, thus accessing the underlying code of Web pages through Perl scripts, and displaying those pages in his own format.

Paul (2007:181) states that in the context of data visualization, the use of the term 'mapping' raises questions about the territory that is being charted. A traditional map is based on a relatively static terrain and meant to assist its users in navigating it, but a map with any kind of digital information is by nature in constant flux and, as a digital map, has to respond constantly to the changes in the data it represents. Paul explains that in the digital world the spaces being mapped can vary from computer networks and the Internet itself, to a specific database and dataset or to the process of networked communication. According to this author, the search engines and browsers are still the conventional ways of mapping the network and filter and access information. *Riot* is hence referred along with *I/O/D*'s *Web Stalker,* Maciej Wisniewski's *netomat™,* and Andrew Kerne's *Collage Machine* as examples of alternative browsers that allow the user to experience the Internet in a way that challenges how information is structured in preconfigured and corporate portals.

Tap, by James Buckhouse, created in collaboration with Holly Brubach, the dancer Christopher Wheeldon and the programmer Scott Snibbe in 2002, was commissioned by the *Dia Center for the Arts* and presented in cooperation with *Creative Time.* The technology for the project was provided by *Palm Inc.,* with additional support from *hi beam*™*,* and the stations were designed by *ORG. Tap* is described as a virtual dance school for animated characters that exist on the Internet and can be downloaded to individual's PDAs and desktops. At the *Tap* Website, users can choose a male or female animated dancer that then takes a life of its own, practicing, learning from other dancers, and giving recitals. The process of how an animated dancer learns to dance and practices routines is so very rich that users do not have to be present during the 'lessons', the dancers can be 'dropped off' to practice by themselves, or can practice at home as screen savers, and their learned routines can be performed to other users.

Fig. 58: Tap (Buckhouse et al. 2002).

The dancers' performances happen on the individual users' PDAs, being the dances downloaded from the users' desktops or from the beaming stations to their PDAs, where they can be performed or beamed to other PDA users. The dance contains a record of all that took to learn a specific movement so its particularities can be incorporated in new dances or reworked individually. In *Tap* the digital data is modular, re-mixable and treated as seeds for new ideas that spread and evolve. The project relies on change, on learning processes, and community, ergo becoming a metaphor of networked communication in itself.

Paul (2007:123) refers to *Tap* along with Lynn Hershman's *Agent Ruby* (2002) as one of the early projects using the *Palm Pilot* platform for distribution, and argues that *Palm Pilots* and *Game Boys,* which she calls *nomadic devices,* become popular as a mobile network that allows its users to download artwork from the Internet and share it with other users. Paul (2007:124) also suggests that the networked art of the future will exist on various platforms and will fluidly travel from the Internet to such nomadic devices. Echoing Paul's predictions, the Austrian software artist Lia created a Website at *iphoneart.org* featuring software art Apps for the *iPhone.* The website informs that the App collection collected by the artist, aims to overcome the lack of an Art section at the *Apple App Store.* This fact causes software artworks made for the *iPhone* to get lost amongst all of the Entertainment or Lifestyle applications that proliferate on the *App Store.* Furthermore, that text states that the ongoing selection of artworks serves as a starting point for further exploration of software art for the *iPhone.*

Brucker-Cohen (2009) refers to the project as reflecting the new ways media artists are finding to integrate their work into a new form of business model. According to the author this integration is already taking part in the niche genre of software art expanded beyond the Web into mobile devices. Once giving away their work for free on the Web, taken as a platform for free limitless distribution accessible through computer browsers, Brucker-Cohen states that media artists are turning their creative efforts toward the mobile space of the *iPhone.* The device senses location, orientation, and ambient noise levels, allowing artists to code their applications to explore this form of live data engagement. This makes the device a unique platform for artistic experimentation, while remaining directly connected to a market

audience of worldwide mobile users in the form of what Raquel Herrera (2009) calls an affordable luxury.

Fig. 59: [Collection] (Flanagan 2002).

[Collection], was presented by Mary Flanagan in 2002 at *The Whitney Biennial* as a projection of the networked software running on a computer. The piece is described in its Website page as a networked computer application that gathers up found material from various users' hard drives, collects them on a centralized server, and creates a visible, virtual collective unconscious. Users that download the *[Collection]* software into their computers have their hard drives reaped for pieces of data, such as sentences from email or letters, graphics, cached images, or sound files, are subsequently combined in a three-dimensional collage of the users' data.

According to the exhibition's literature, *[Collection]* is an extension of a Mary Flanagan's previous project *[Phage],* in which she created the same kind of moving 3D maps based on data culled from a single user's computer. It is stated that while *[Phage]* allows users to experience their own computer's memory, *[Collection]* extends this notion into the network, where the combined data becomes a multilayered rendering of the users' life experiences. Furthermore, *[Collection]* is compared to the human mind in the way that it seems to operate by association, as the software snaps from one item to the next. The results are explorations of the parallels and borders between human and computer memory as a collective unconscious. The presented constellation of bits and pieces of data happening in *[Collection]* is also said to mirror the profound effect of new media technology in our culture.

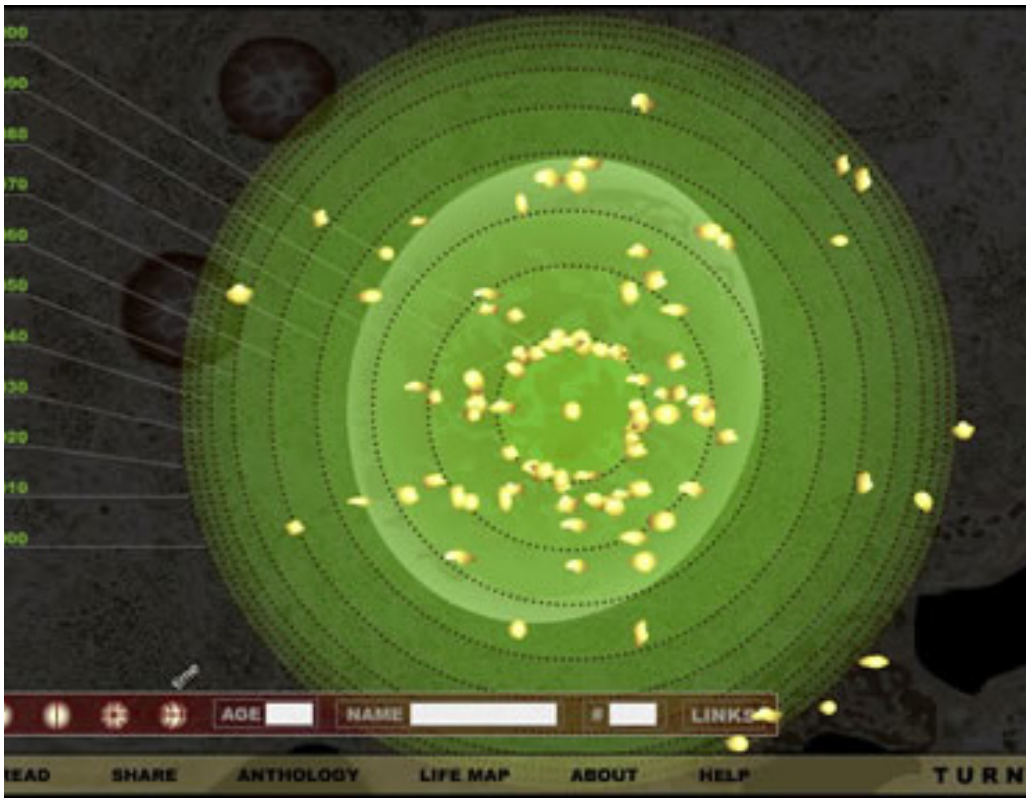

Fig. 60: Turns (Lovejoy 2001).

Turns, made in 2001 by Margot Lovejoy with Hal Eager, John Legere, and Marek Walczak, was presented at *The Whitney Biennial* as a website, using a computer and a screen. *The Whitney's Artport* Website page describes that project as collecting and sharing personal stories of life turning points, and as providing connections to those lives, which were lived under many circumstances and in a range of different time spans. The text states that *Turns* allows the turning points in life to be seen through relational filters, lenses and links and that each individual story is understood as part of a social memory. In this way, the Website also constitutes a valid investigation of how the new media are influencing and changing the notions of the individual in a social context. The project's description highlights the possibilities of the Internet for creating networked communities and relational databases of personal experience as central for its becoming of a form of collective, social consciousness.

The stories in *Turns* are browsable according to twelve categories, and visitors can contribute with their own narratives to the Website, reorganize the stories through

filtering, access related databases, and draw a "life map" which visually represents the course of their lives (Lovejoy 2002). On the Website of the project one can read that *Turns* is designed as a participatory experience, as though one is taking a walk in the beach, reviewing turning points in one's life, and opting for sharing something important while in contact with the stories of others.

The Whitney Biennial 2002 Net Art Selection exhibition list two other pieces, *World of Awe,* 2000, by Yael Kanarek, and *Proxy,* 2001, by Robert Niedeffer. Christiane Paul had previously curated *Data Dynamics* for *The Whitney* in 2001. At *The Whitney Artport* past exhibition's page can be read that *Data Dynamics* is an exhibition of Internet art that focuses on a prominent issue in this new medium: the search for visual models that represent a continuously changing flow of data and information. The Internet art projects, exhibited both as Installations at the Museum and in *The Whitney* online gallery, portray models that offer navigational possibilities for experiencing visual and textual information, each of them focusing on different dynamics of data, whether in the context of mapping language, stories, memories, or traffic in physical spaces (Paul 2001).

Alex Galloway (2001) refers that although not all the pieces in the show require the Web to function, *Data Dynamics* is essentially a Net Art show in which the curator, Christiane Paul, met the challenge of how to stage such an exhibition with American artworks when Net Art has historically been very "non" American. This circumstance may have led Paul to select projects from the New Yorker Net Art scene. Valerie Lamontagne (2001) states that the selection of the five projects in *Data Dynamics,* although divergent in aesthetics and themes, follow the common kinship of data-infused interactivity, and coalesce around a mutual theme of what Paul, the curator, coins as "dynamic mapping"—a continuous flow of the data, a matrix from which the Web is built.

Data Dynamics features five Net Art projects by Marek Walczak and Martin Wattenberg, Mark Napier, Maciej Wisniewski, Beth Stryker and Sawad Brooks, and Adrianne Wortzel (Paul 2001). In an interview with Sarah Cook (2001) Paul, referring to the design of the exhibition, states that all the Net Art pieces in *Data Dy-*

namics are shown as projection-Installations, mainly because all of them make sense in physical space or already consider that component.

Apartment, by Marek Walczak and Martin Wattenberg, with additional programming by Jonathan Feinberg, 2001, was shown as a Website and networked Installation, using computers, a printer, a desk, and a projector. On *The Whitney Artport* project page we can read that *Apartment* is inspired by the idea of the memory palace, a mnemonic technique described in the 2nd Century BC, by the Roman orator Cicero. He imagined himself inscribing the themes of a speech on a suite of rooms in a villa, and then delivering that speech by mentally walking from space to space.

The same equivalence between language and space takes place in *Apartment,* where a connection between the written word and different forms of spatial configuration is established. Viewers of the project type some text in a blank screen, a semantic analysis of the viewers words generate rooms as a two-dimensional plan that is later translated into navigable three-dimensional apartments composed from the images that appear as projections on the wall. These apartments are then clustered into buildings and cities according to their semantic relationships (Walczak & Wattenberg 2001).

The project's Website describes *Apartment* as a series of related works in which all versions explore the relation between language and space, building 2D and 3D "apartments" in response to the viewers' typing. Galloway (2001) refers to *Apartment* as hinting at a conversion between words and spaces, in which the semantic connections were made by the artists themselves. They managed to do so by creating a mini-dictionary of the couple of hundred most common terms they were likely to encounter—with words like "you" and "love" becoming the bedroom, while "book", or "sentence", become the library— and the final artwork being rendered as an imaginary apartment in 3D. Frieling (2004) refers to the blinking cursor inviting us to type text as a start-up for *Apartment,* an utmost appealing element of the electronic writing process. The signal as a dividing line it embodies the place between sign and emptiness, but as an interface, locates the place where we begin—an empty page to be filled in a number of ways.

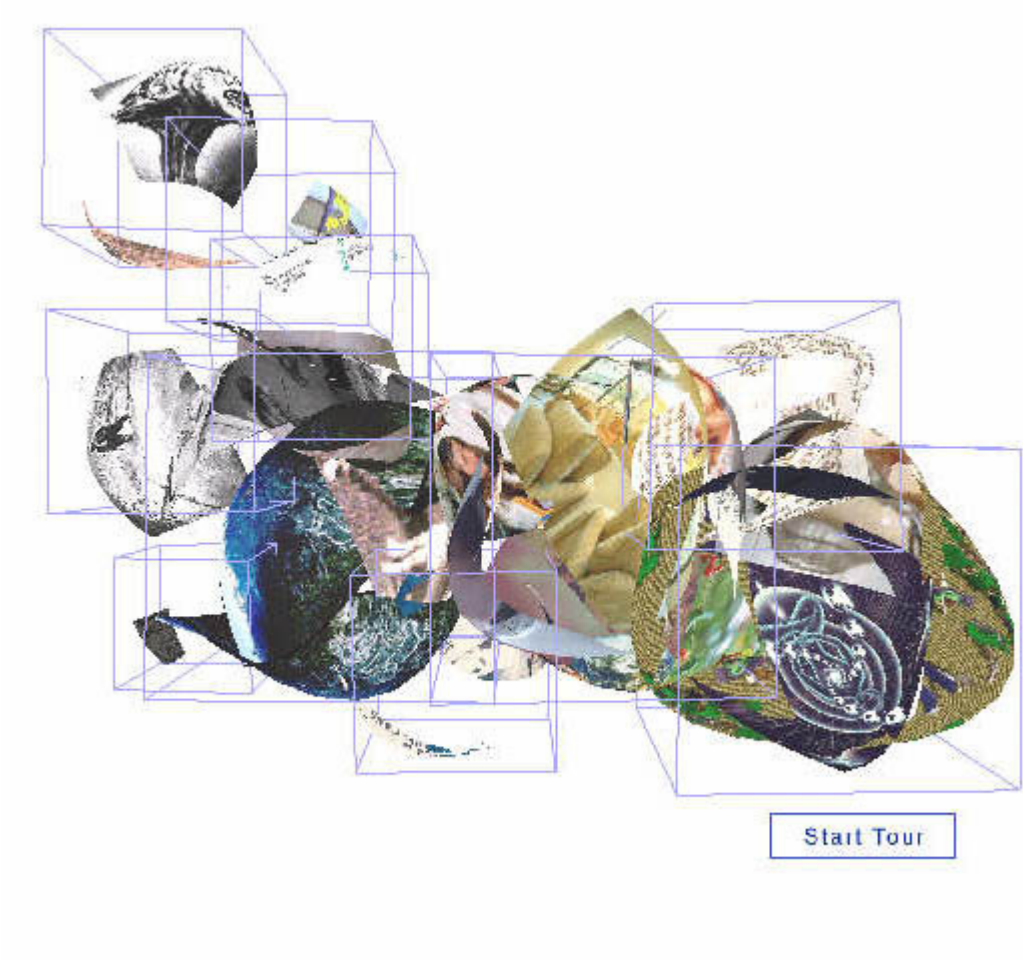

Fig. 61: Apartment (Walczak et al. 2001).

Paul (2007: 175) refers to *Apartment* in the context of 'information spaces', stating that since the advent of the digital technologies that the information spaces and the creation of visual models gained immediate interest. This is due to the fact that they allow for a dynamic visualization of any kind of data flow, while becoming a broad field of experimentation and research in many disciplines, from Science to Statistics, including Architecture, Design, Digital Art, or any combination of them. The author also ties down the idea of 'information space' with the notion of information architecture, stating as previously noted that every 'container' of information, be it a library, a building, or a city, is essentially a dataspace with an information architecture of its own. Therefore, the idea of information architecture relates directly

to the principles of memory theaters and palaces which, according to Paul, have experienced a revival in the context of digital art.

As well as collaborating with Marek Walczak in long term projects such as *Apartment, Wonderwalker, Thinking Machine* and *Noplace*, under de name *MW2MW,* Martin Wattenberg's work is referred again in the study's database, and two other works made by him are included as data.

Map of the Market, that Wattenberg created with the collaboration with Marc Frons and Joon Yu, is referred in the author's Website as one of the first visualizations on the Web, displaying live stock market data since its creation in 1998.

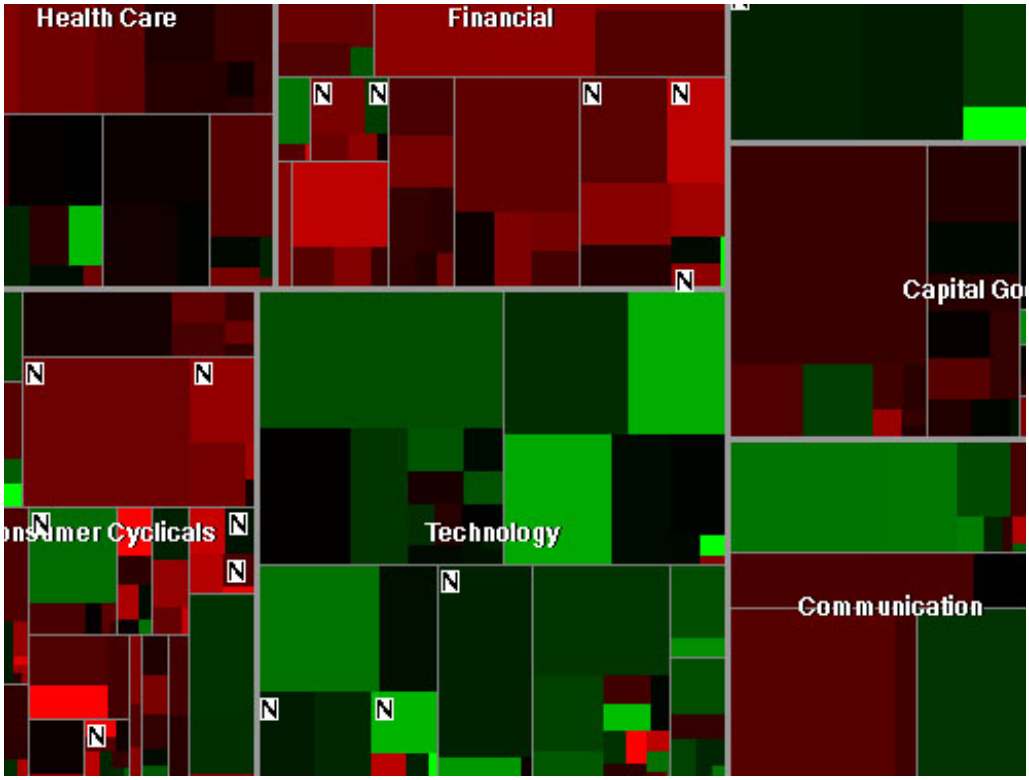

Fig. 62: Map of the Market (Wattenberg , Frons and Yu 1998).

Wattenberg states that the creation of the project while at *Smartmoney.com* aimed to give a quick answer to the question of "What was happening in the market?" A reference is also made to the use of a variant of the "treemap" technique pioneered by

Ben Schneiderman, which is now said to constitute a standard tool for visualizing financial data. The project's description reads that the screen is divided into rectangular tiles representing publicly traded companies in which the area of the tile corresponds to the market capitalization of the company, and the color indicates how the stock changed since the previous market close. Wattenberg underlines the fact that this solution introduces a new algorithm which, unlike in traditional treemaps, is designed to create tiles close to a square, making for a display that is easier to read and to interact with.

Vesna (2008) refers to the project as a visualization that allows its users to see the performance of hundreds of stocks at once, with a rich context of industry and value information, and as an implementation of a new algorithm that allows an existing visualization technique, the treemap, to scale any movement more effectively. Martin Dodge (1999) commenting on the daily fluctuations in the stock market as serious business for traders, analysts and investors, states that *Map of the Market* is one of the best visualization tools, because it can show the changing stock prices of over 500 hundred publicly traded companies on a single screen, providing people with an answer to the basic question of "How is the market doing today?" at a single glance. Wattenberg, quoted in Dodge (1999), says that the popularity and the success of *Map of the Market* happened for two reasons: first, it communicates a huge amount of live data that is important to many people; and second, because of the time invested in getting every detail related with the user experience right.

For *The Whitney Artport* Website's first commission, Wattenberg developed the *Idea Line* in 2001. On the *Artport* Website the project title is designated *A Net Art Idea Line, Mapping lines of thought through time.* Wattenberg introduces the project commenting on the multiple paths traveled by Net Art and how the Internet, more than a medium, constitutes a uniquely hospitable environment to many diverse media, such as programming and animation, video and audio, game-play and community. According to Wattenberg, this diversity echoes different threads that are picked up and weaved by each individual artist in novel combinations, and that the *Idea Line*'s design let its users follow these threads of thought and discover each work as a part of a large tapestry.

In its instructions, the project is described as displaying a timeline of Net artworks, arranged in a fan of luminous threads corresponding to a particular kind of artwork or type of technology. The variable luminosity across each thread indicates the number of artworks produced each year, relating to a particular type or line of thought, so it is possible and easy to have an idea of how prolific a line of thought is in the timeline. Hovering each line reveals the titles of the artworks, hovering each title reveals information about the artwork, clicking launches the project, and shift-clicking reveals other pieces in the *Idea Line* by the same artist. It is also possible to search and filter all projects through an artist or a project title, just by imputing text in a search box and see the results in the context of the overall *Idea Line,* while choosing to visualize the *Idea Line* through three different geometries.

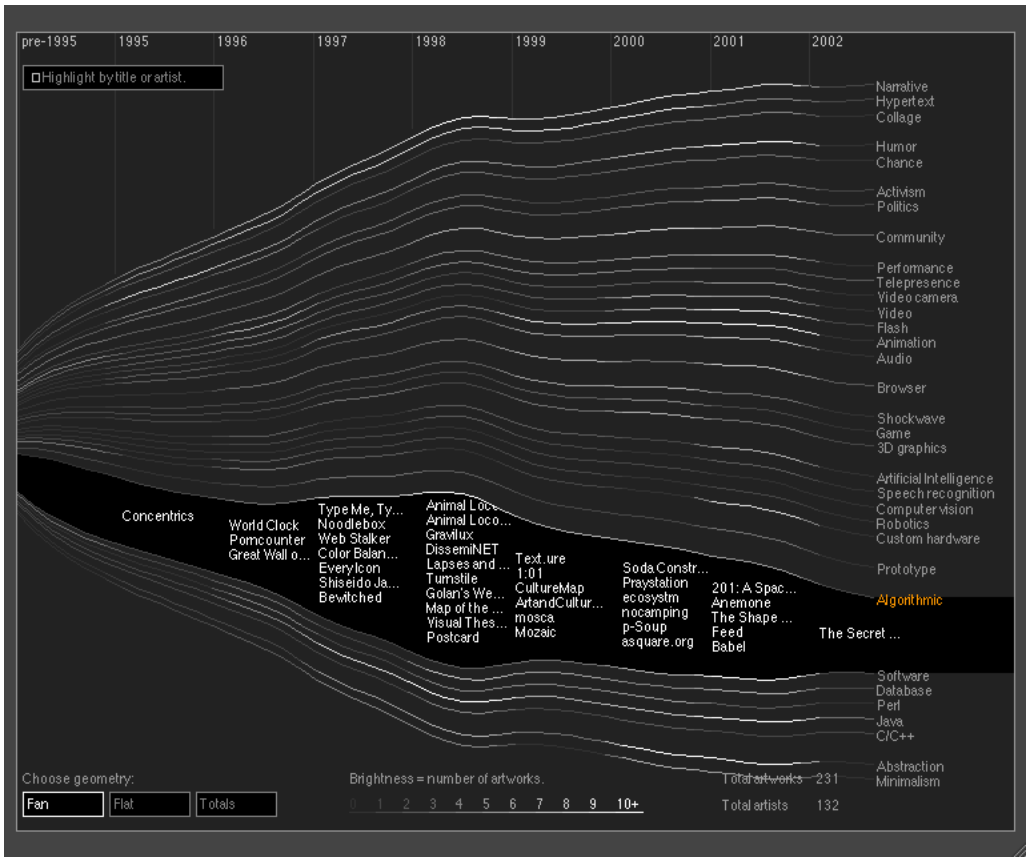

Fig. 63: Idea Line (Wattenberg 2001).

The *Idea Line* compiles 231 artworks by 132 artists, distributed by 33 horizontal idea lines, vertically yearly divided in 9 columns, 8 corresponding to a period between

1995 and 2002, and a first one related to artworks created pre-1995. At the project's *Artport* page we can read that the artworks listed were compiled through a public call launched into Net Art forums. The generated response came from almost 100 artists and in addition, the authors entered data on many popular or influential artworks that were not covered in the public request response.

One of the lines of thought on Wattenberg's *Idea Line* lists 31 net artworks under the tagline *Database.* On the available text-only database list of the artworks, we learn that the lines are divided into keywords and technologies, and that the *Database* line is listed under the *Technology* column.

Fig. 64: Point to Point (Napier 2001).

Point to Point, 2001, by Mark Napier, was commissioned by *The Whitney Museum,* and additionally credited to Ethan Gold, Liza Sabater, and James Bruce. The project was presented at *Data Dynamics* as both a networked Installation and a Website.

It used a projection and computer vision to create a live interaction between the movements of the people in the physical space of the show, and a database of words submitted to the Website of the project by its users. The *Artport* project's page designates *Point to Point* as a Public Art piece in which the motion of people in the space is used to drive an evolving graphic display projected onto a wall and also made visible in the project's Website. The Web visitors can also follow the motion of people in the installation in real-time. We cal also read that *Point to Point* transforms a public space into a Performance space, being that the participation of the public in the artwork happens just by walking into and around the space.

On the project's Webpage is written that the project explores the relationship of the brick-and-mortar world to the virtual world of text, content and information. We can read that the project paints the Internet as a world of swirling, radiant text, in which people are represented as streams of letters and punctuation. This is an exploration of our relationship to the Internet as well, and is made possible by creating a connection between the spaces of physical reality and digital data (Napier 2001).

netomat™, by Maciej Wisniewski, 1999, was presented at *The Whitney Data Dynamics* exhibition as a meta-browser using computers and projections. On the *netomat™* Website is explained that the original piece was conceived as a network-based art project, and as an open free-form, and a flexible alternative to traditional page-based HTML browsers and search engines. Further written information on the project, denominates it as a unique Multimedia network 'viewer', launched in 1999 at the *Postmasters Gallery* in New York, from where the piece was downloaded by nearly a million people in more than 80 countries.

The *netomat™* presented at *The Whitney Data Dynamics* in 2001, is listed as one of the artistic explorations built upon the core idea and underlying technology of *netomat™* by Wisniewski. The project page at the *Artport* Website reads that *netomat™* takes its visitors for a ride in the Internet's subconscious, and that unlike traditional Web interfaces, such as Web browsers, *netomat™* engages an Internet that is alive and unpredictable. *netomat™* responds to text typed-in by the viewer to retrieve text, images, and audio that is flown freely by the software onto the screen, using a new audio-visual language designed specifically to explore the unexplored Internet.

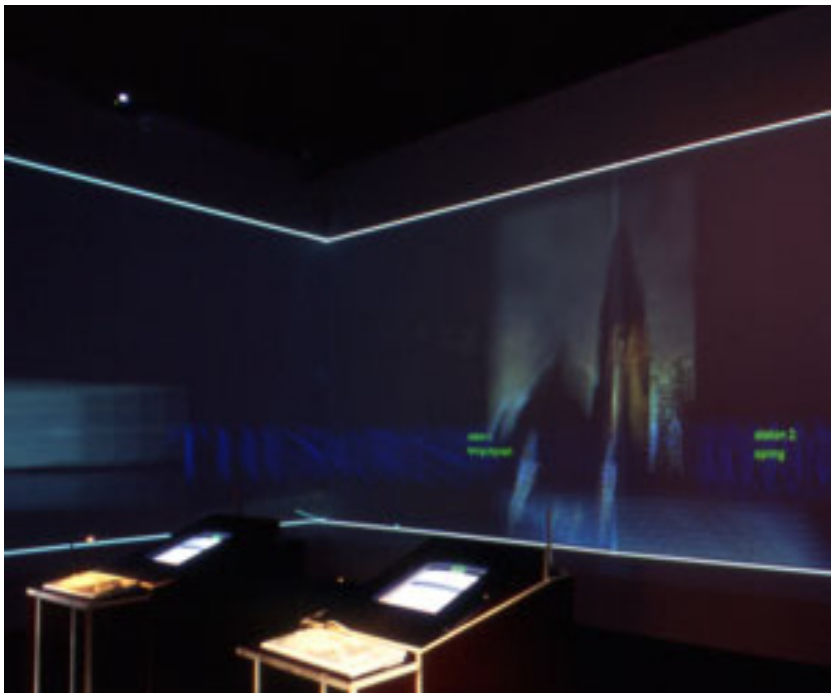

Fig. 65: netomat™ (Wisniewski 1999).

The project's description states that the *Data Dynamics'* visitors enter a *netomat*™ theater and are surrounded by a collage of streaming images, texts, animations, voices, and music. The software triggers all these elements and we can traverse the Internet's subconscious by both selecting the inputs and steering the visual flow of information. In the *Artport Idea Line* database is written that *netomat*™ engages a different Internet—one that is an intelligent application rather than simply a large database of static files—it establishes dialogues with the Net to retrieve information as unmediated and independent in form, and it allows the user to relate to the Internet using natural language (Wisniewski 2007). Paul (Cook 2001) states that *netomat*™ is a piece that rewrites browser conventions, as it "begs" to get out of the browser window, and it tries to present the Web as an infinite data-scape and data-space. It follows stating that its powerful engine can do anything, from creating animated webs—such as the *Data Dynamics* Website created in netomat—to using the Net as a type of search engine that the viewer can dialogue with from two stations, as is the case in *Data dynamics.* At the date of the writing of this study, the *Data Dynamics* url on *The Whitney* Website retrieves a not found Webpage.

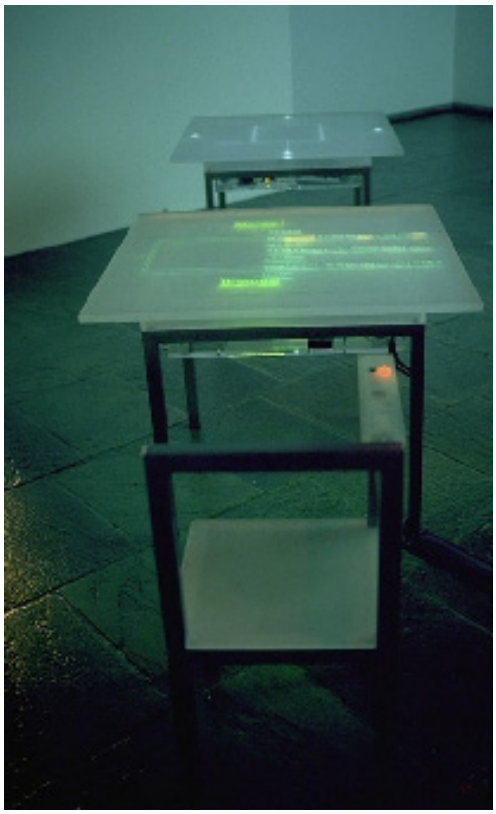

Fig. 66: DissemiNET (Brooks & Stryker 1998).

DissemiNET, by Sawad Brooks and Beth Stryker, 1998, presented as a Website, projections, a networked Installation running on computers, and interfaced by two telematic tables, was commissioned in part by the *Wexner Center for the Arts,* and the *Ohio State University,* in Columbus. The *Artport* project's Website page states that *DissemiNET* is a curated and public participatory system conceived to elaborate a diaspora on the Web. While drawing a parallel between real diasporas and the dispersal of meaning over the Web, provides spaces for people to recollect and retell their stories and their experiences with homelessness and dispersal (Brooks & Stryker 1998). The *DissemiNET* authors use the Internet to collect, store, and disseminate stories recounting the "disappearance" of youths during the El Salvador civil war, gathered in collaboration with an agency, *Pro Busqueda de Los Ninos,* that helps to trace children abducted during the conflict.

The interface between the transient public space of the installation and the *DissemiNET* Web-space is established by two free-standing multi-user hardware/software telematic tables. Here the local communities can view and input (collection) and output (recollection) stories. The stories can be retrieved by search words, themes, or key concepts. The system creates connections or 'crossroads' amongst stories through searching fragments of text relating to the themes, and containing words that are similar visually or syntactically. These are then displayed in the "crossroads interface".

Dietz (2007:117) refers to *DissemiNET* as a data-driven compilation of user-defined stories paralleling to open archives such as Antoni Muntadas, *The File Room,* already referred in this study. The approximation between the two projects derives from for the fact that anyone can, at least during the projects initial installation, upload their stories related to the topic. In a section designated *Data Stories,* Dietz article quotes the Linguistics' researcher Walter Ong, who determined that Homer substituted a stock set of phrases according to identifiable regular occurrences, suggesting that storytelling and information systems are not inherently as incompatible as they may seem. It follows by stating that *DissemiNET* lies somewhere between the particular instance and the composite whole, underlying the fact that the fuzzy algorithm used to "curate" the database creates relationships among stories—data—as a way to investigate semi-automated storytelling in relation to very large datasets.

Closing the set of participants in the *Data Dynamics* exhibition is Adrianne Wortzel with her project *Camouflage Town,* 2001; a networked robotic Installation, a Website, computers and video cameras. Wortzel's piece was commissioned by *The Whitney* and developed at *The Cooper Union for the Advancement of Science and Art* with a grant from the *National Science Foundation* and support from the *NSF Gateway Engineering Education Coalition* at *Cooper Union.*

The project's description reads that *Camouflage Town* creates a theatrical stage set for a robot that lives in the museum space and interacts with the visitors. The installation robot is named Kiru, and is stated that it comments on its environment, transmits video images to monitors, and can be remotely controlled by visitors through the computer. In the telerobotic interactive Installation, Kiru allows interaction be-

tween physical and remote viewers, and when not being controlled by a Web user, it autonomously emit pre-recorded speeches continuously thwarted by remote visitors taking control over its functions of motion, speech, and camera, and asserting control of the medium over the message (Wortzel 2001).

Running parallel to *Data Dynamics* at *The Whitney* was a larger exhibition named *BitStreams.* This art show was curated by Lawrence Rinder, and is described by its organizers as a provocative and stimulation presentation of contemporary art that harnesses digital media to achieve new dimensions of artistic expression. These other expressions would be in reach through the transformation of images, space, data, and sound. The exhibition is also said to shed light in the fascinating crossovers between media—Photography, Film, Video, Installation, Sculpture, and Sound—and aiming to develop closer connections through a common use of digital software (Rinder 2001).

Galloway (2001), in his article about conversions, referring to *BitStreams* states that the exhibition is not strictly a New Media art show, and that although *The Whitney* should be praised for showcasing digital art, *BitStreams* proved once and for all that the Photoshop know-how does not automatically provide for New Media art, and the exhibition is also said to fall short, for being too hesitant and too technophobic.

Galloway (2001) says that Net Art is all about conversions, because it needs data like paintings need pigment, and that in his opinion converting data from one media to another gives Net artists the basic material they need for their artmaking. He follows by stating that the 'current' practice of Net Art has become increasingly focused on what is called a 'phase shift' process, whereby one data mode is translated into another. Some examples of artworks that rely on conversions would be the Vuk Cosic's work focused on converting various media formats into ASCII characters; the *ASCII History of Moving Images,* a video to ASCII converter that transforms clips from films such as Hitchcock's "Psycho" and Antonioni's "Blow Up" into full motion green-tinted text; a variety of projects also relying on data conversion, such as the *Rhizome* logo, designed by Markus Weisbeck and Frank Hausschild, as a conversion piece that translates IP addresses into a dynamic visual icon; *Time as Color,* a net art piece from Christopher Otto that converts time into RGB color values;

Barcode, made by Andy Deck, that translates works of literature into visual symbols; or the *Vinyl Video* project that makes art out of the conversion between the video format and vinyl recording format.

Galloway refers that, even if only at a basic level, the art of conversion also underlies the curatorial philosophy behind the exhibition *BitStreams*. Although there are pieces that lack the bit stream in the exhibition title, he singles out Jim Campbell's *LED* pieces, and of interest to this study's data, Jason Salavon's piece, *Top Grossing Film of All Time, 1x1,* from 2000. In this project the top grossing film of all time is resampled to make each frame from the film a single pixel in the artwork, and stripes of color run left to right as if the film scenes were playing themselves in miniature (Galloway 2001).

The project's webpage states that James Cameron's *Titanic*, was digitized from video in its entirety and broken up into its constituent frames, which were then averaged to a single color and reformatted as a photograph. These images mirror the narrative sequence of the film in order to enable a reading of the film's narrative visual rhythm, as laid out in pure color (Salavon 2000). Whitelaw (2007) is interested in two other pieces from Salavon's body of work that convert video input signal in real-time to average color streams of abstract images: *Everything All At Once,* 2001; and *Everything All At Once (Part III),* 2005. The author refers the use of overdetermined content as a source material, such as the highly familiar, the ultra-produced, the most redundant, and banal. He explains that in a deadpan generative strategy, its abstraction extract aesthetic pleasure from the mundane, and yet, it also refers its data sources—the underlying 'real'—as an abject, and ultimately, empty mass of generic content (Whitelaw 2007).

Also in the study's data from Jason Salavon is *Portrait (Rembrandt),* 2009, described in the author's Website as likely the final installment of a broader series begun in 1997, constituted by a series of pictures that employ the bulk of the portrait oeuvres of Franz Hals, Rembrandt Harmenszoon van Rijn, Anthony van Dyck, and Diego Velázquez. As it happens, a simple algorithmic mean-averaging of high-quality reproductions of the paintings, yielding what the author calls an atmospheric meta-portrait (Salavon 2009).

Fig. 67: Portrait (Rembrandt) (Salavon 2009).

The piece's image is the result of an amalgamation of all of Rembrandt's work in portraiture. It makes use of a mathematical mean-averaging process to obtain a single image. *Portrait (Rembrandt)* is the average portrait of all Rembrandt's portrait oeuvre. The project allows its viewers to glimpse at an impossible ghostlike image of the body of work of a master painter, and at the same time it obfuscates the individual quality of every piece in which the mastery lies upon.

Also referred in Whitelaw (2007), and paralleling Salavon's cited pieces, is Brad Borevitz' *State of the Union,* in which the artist uses as dataset for the work, the texts of all the *State of the Union addresses,* from George Washington in 1790 to Barack

Obama in 2010. This dataset at the time of this writing contains 220 documents, 1,669,862 words, and 26,711 unique words. According to the project's Website page, the data underneath the map of significant words shows trends in the language of the *State of the Union Addresses,* and Whitelaw (2007) states that the visualization is dominated by a text cloud whose shape and content conveys a rich and legible impression of each text, as well as its relation to a historical *corpus*. As we flick through the years we seem to see issues, crisis and rhetoric incessantly come and go.

Borevitz (2007a) states that *SOTU* explores the relation between the individual addresses as compared to the entire collection, highlighting what is different about the selected document. It also invites the viewer to try to understand from all this gathered information the connection between politics and language—between the state we are in, and the language who names it and calls it into being. According to the project's description, each *SOTU* address is visualized as a cloud of words that maps the significant content of the address, its key terms and their relative importance. The horizontal axis shows the average position of every word in the document, while the vertical axis displays the relative frequency, according to the document and the entire corpus of the addresses data. The most common words, such as "and", "the", "states", etc., are filtered out, remaining the words that are especially characteristic of each address. Its size indicates how many times each word was used in the document.

Whitelaw (2007) groups Borevitz and Salavon's pieces in a chapter designated *Anti-Content and the Artist's Squint,* in which is stated that in treating these texts as a dataset, Borevitz neutralizes them as content, and uses the data practice to abstract or distance the content's story; that is all too familiar, historicized, debated, and trashed out in the public discourse, leading to the contemporary dismay that underpins the work; and that in a process to open the content up, there is a search for alternative meanings or clues. It abstracts the obvious rhetoric of every document, neutralizing its iconic language in a process that Whitelaw (2007) refers to as a double movement, from information to data, and back to (prospective) information.

Whitelaw (ibid.) quotes Borevitz (2007b) recalling what the artist coins as "the sorry state we're in": "Perhaps counting is a defense against the spell of iconic language";

"It may be that counting is simply the automation of a practice that we participate in already, as we measure unconsciously our saturation in the messages of the media—as they work us over completely."

It is stated that counting, as a form of quantitive analysis, appears a way to tunnel under the established information contained in the texts, because their information is turned back into raw data for its users to interpret. Here Whitelaw (2007) compares this action to a kind of artist's squint, which is used in painting and drawing as a kind of perceptual abstraction technique. Squinting conveys the blurring of the detail, so that recognizable objects are abstracted into visual forms: shapes, tone, and line. Thus the squint overturns visual information in order to access its "raw data", and in the case of Borevitz' *SOTU,* where the aim is realism, seeing "reality" means discarding the information, as well as the observation of its raw data.

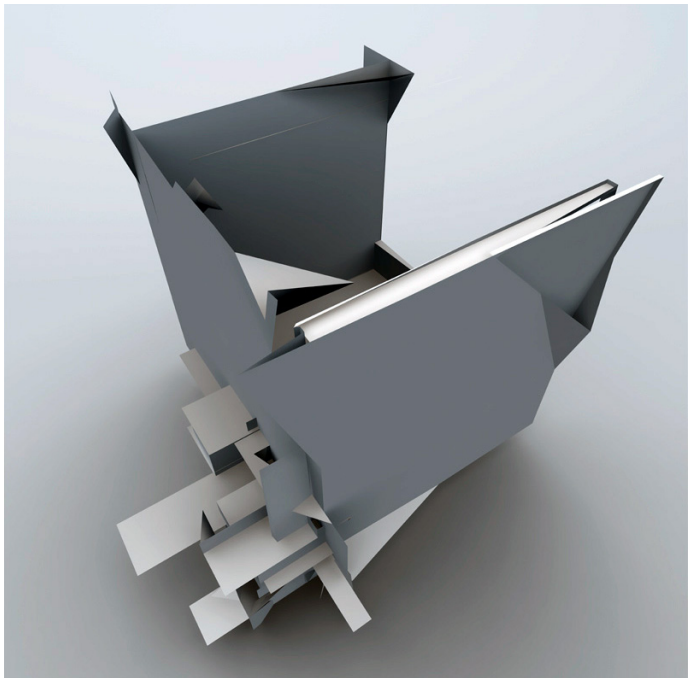

Fig. 68: Spam Architecture series (Dragulescu 2005).

Alex Dragulescu made *Spam Architecture* series in 2005, as a project constituted of images generated by a computer program using junk mail as the input, and translating into three-dimensional modeling structures variables such as patterns, keywords and rhythms found in the text sources (Dragulescu 2005).

Whitelaw (2007) refers to Dragulescu's *Spam Architecture* piece, along with other project by the author that uses the same process but with a different output translation, the S*pam Plants* from 2006, to introduce the possibility of creative projects made by who decide to cut data loose from producing new insights into reality, and in turn explore its own self contained abstraction and its inherent malleability.

Spam Architecture's uncanny constructions or *Spam Plants'* organomorphic, multicolored, and translucent forms have their ontology in what Whitelaw designates as abject data, to point out the notion that in the digital realm, the process of mapping something into something else is an open way to a state of polymorphism where anything can be anything. Lev Manovich (2002) understands this step into a possible state of arbitrariness and polymorphism as the "built-in existential angst" of both the data art and the digital medium in general (Whitelaw 2007).

Whitelaw (2007) quotes Manovich's (2002) observations saying that "by allowing us to map anything into anything else … computer media simultaneously makes all these choices appear arbitrary—unless the artist uses special strategies to motivate her or his choices". Whitelaw notes that Manovich also suggests, albeit hesitantly, arbitrary mapping as a criterion for judgment. This seems to be apparent in the following statement: "maybe in a 'good' work of data art the mapping used has to somehow relate to the content and context of data." However, in relation to the idea of a strong correlation between the act of mapping and the data context, Whitelaw argues that Dragulescu's work shows that some relation between mapping and data context—or between input and output—inevitably emerges, even when no direct or intrinsic relation exists.

Referred in Whitelaw's paper (2007), and besides the artifacts referred above, the study has already described Lisa Jevbratt's, *Infome Imager Lite,* 2002-2005, and with C5, *1:1,* 1999-2002, and will further investigate, also as a part of the study's data, *The Dumpster,* by Golan Levin, Kamal Nigam, and Jonathan Feinberg, 2006; *The Idea of a Tree,* by Mischer'Traxler's Katarina Mischer and Thomas Traxler, 2008; and Mitchell Whitelaw's own later piece, *Weather Bracelet,* from 2009.

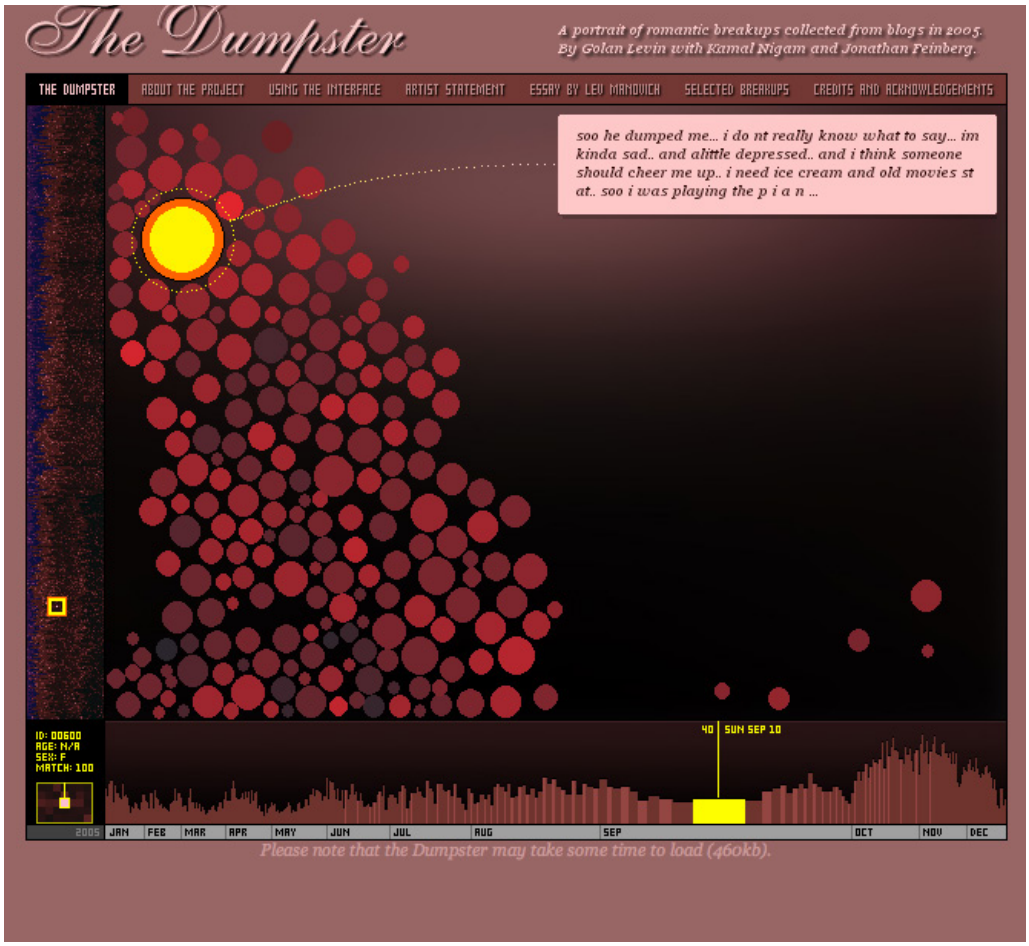

Fig. 69: The Dumpster (Levin 2006).

The Dumpster, 2006, according to the project's Website page, is the first in a series of three net-based artworks co-commissioned by *The Whitney Artport* and the *Tate Online.* The text that describes the piece resumes it as an interactive online visualization that attempts to depict a slice through the romantic lives of American teenagers. Its viewers can browse through thousands of relationships, extracted from real postings of millions of online blogs, where the common denominator is the fact that the postings are about one person 'dumping' another. It is stated that the project reveals the astonishing similarities, the unique differences, and underlying patterns of the failed relationships, providing both peculiarly analytic and sympathetically intimate perspectives onto the diversity of global romantic pain (Levin, Kamal & Feinberg 2006).

Golan Levin's artist statement (2006) shows his attraction to the revelatory potential of the visualization of information and starts by quoting Richard Hamming's saying: "The purpose of computing is insight, not numbers." Levin (2006) states that information visualization, traditionally a tool pertaining scientists and engineers, has increasingly become a powerful new tool for artists as well. They are allowed to present, search, browse, filter, and compare rich information spaces in order to discover and reveal new narratives otherwise hidden within the data-flows of our world. Levin adds that whether the subjects of information visualization relate to a single participant, the information culture we inhabit or the formal aspects of mediated communication itself, when used as an interrogative mode of artistic practice has the potential to offer us a new perspective of our own selves.

While Manovich's (2006) characterizes this project as a group portrait appropriate for the age of data mining, large databases, and global surveillance programs such as Echelon, Levin (2006) suggests that it is also possible to characterize it as a technological enabled assemblage of self-portraits, existing in a portal that allows the individual voices of the represented to be contextualized, and/or simultaneously magnified and diminished in individual significance as the viewer navigates the project.

Manovich (2006) states that *The Dumpster* plots the romantic lives of teenagers, through a dynamic visualization that draws its data from live Blog's entries, and that the project is an example of social portraiture, documentary and database art. Referring to *The Dumpster*'s emotional subject, Manovich (2006) ask us to consider the paradox that derives from the fact that there were some decades in the 19th Century when inner feelings and human emotions were depicted in the arts, and that also was coincident with the rise of statistical and social imagination.

Manovich (2006) calls *The Dumpster* a social data browser in which the particular and the general of the intimate details of people's experiences are presented simultaneously, without one being overshadowed by the other. As the author acknowledges William Gibson's prediction of the cyberculture of the nineties and the then prevalent idea of virtual navigation through data, he also suggests that Gibson's naming of its later novel *Pattern Recognition,* points to a new period of more prosaic, but

ultimately more consequential ways of exploring data. These would include search engines available to the masses and data mining with the equivalent strength to the one that companies and government agencies have at their disposal.

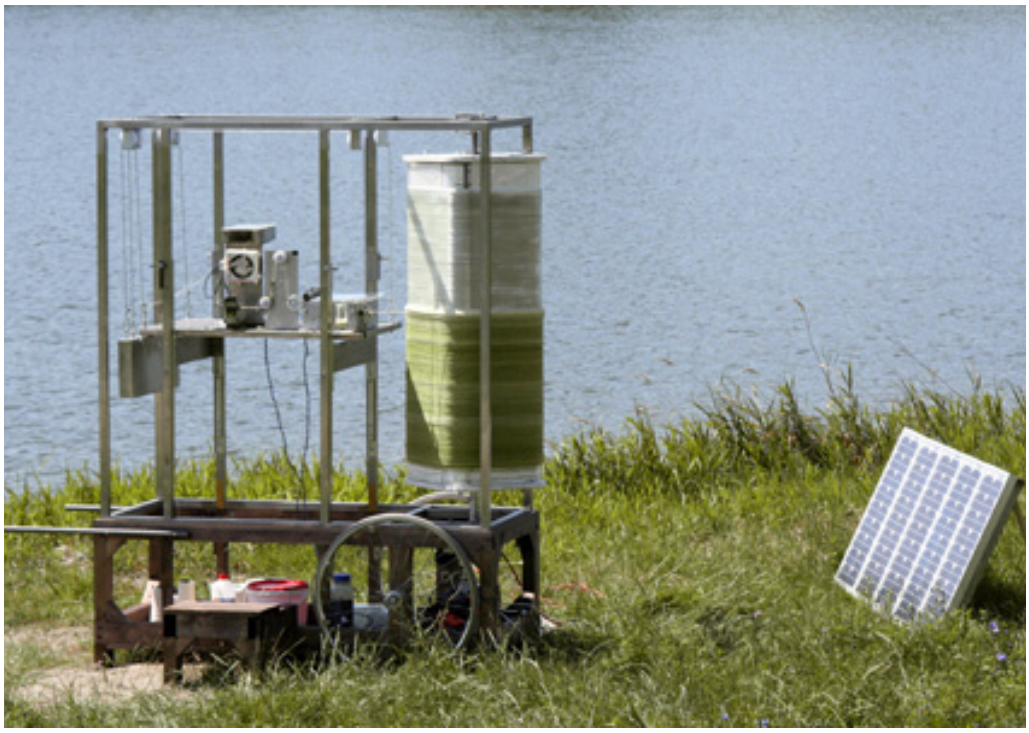

Fig. 70: The Idea of a Tree (Mischer & Traxler 2008).

The Idea of a Tree, by Katarina Mischer and Thomas Traxler, 2008, is a solar powered fabricator. The machine translates the luminosity of the Sun into a string and an epoxy shape with variable density according to subtle daylight variations. It literally grows an object that is a direct recording of the specificity of the light in a place, translated into energy and then reflected upon the morphology of that same object. The project's page describes its concept as being inspired by a fascination with machines and nature. It states that a tree is a product of its specific time and place, that it reacts and develops according to its surroundings, and that it constantly records various environmental impacts in its growth process. As each single tree carries the story of its particular development, the authors' aim with *The Idea of a Tree* was to translate the recording qualities of a tree and its dependence on natural cycles into products.

As the title of the project suggests, the concept behing *The Idea of a Tree* is rooted in the natural growing patterns of the trees and particularly how they are living organic records of their own context and surroundings. The machine weaves a subtle environmental recording with the size of a day-long energy flow. When the sun sets at the end of the day, the object, as some sort of organic output resulting of natural phenomena, is, in Thomas Traxler's own words, ready to be harvested.

Whitelaw (Smith 2008) refers to this project as a chain of analog transductions that produce an object that manifests specific changes in its local environment. He states that the work is a beautiful demonstration of how variability does not have to be worked up with a generative code, when and if the system is open to it, because variability is already present in the flux of the material field.

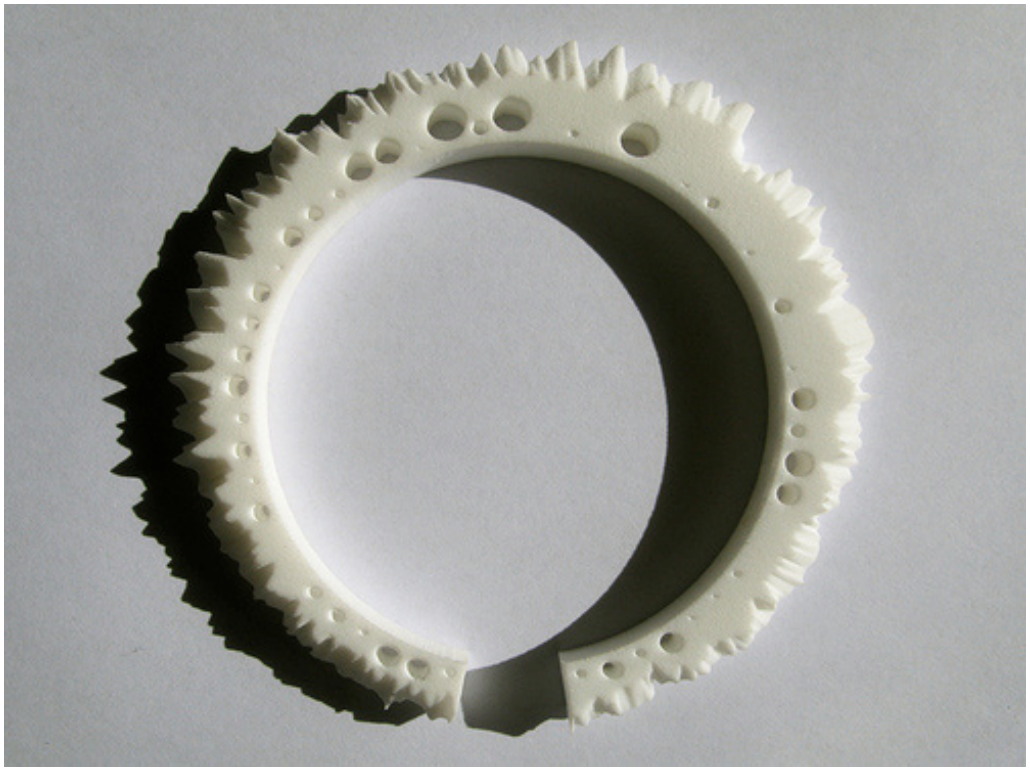

Fig. 71: Weather Bracelet (Whitelaw 2009).

Mitchell Whitelaw's own project *Weather Bracelet,* 2009, is a fabricated object representing one entire year of Canberran weather data. The dataset, consists of 365 days of the maximum and minimum temperatures in Canberra, plus a weekly rainfall,

and is made tangible in a circular wearable shape. The wearable data-object, as Whitelaw (2009) calls it, embodies an entire year of weather flowing around the user's wrist. The author states that the bracelet makes data tangible and also invites an intimate, tactile familiarity through the finger recognition of the generated form, and in this way its relation to the personal data reality conveyed. Whitelaw also says that the bracelet works as a mediator between memory and experience, and between the public and the private, turning the weather data in some sort of shared platform on which the personal is overlaid.

Referring to the form's local specificity, the author highlights that the most exciting aspect of digital fabrication and 'max customization' is the way in which the generalizing infrastructures of computing and fabrication can be brought-back to a highly specific localized point and therefore increase the potential for objects that are intensely and specifically local.

The *Weather Bracelet* reflects Whitelaw's focus on the notion of "transmateriality", where instead of reading information and mediated experience as virtual or "disembodied" the investigation focuses on the tangible, idiosyncratic nature of the digital (Smith 2008). Whitelaw (Smith 2008) states that the materialization of digital systems also embeds them more deeply in their surrounding environment, and refers a fascination with the above referred project *The Idea of a Tree,* as a kind of non-digital "transmateriality", and a material system that manifests structures in its specific, local environment.

The study has already referred *C5 corp*'s collaboration with Lisa Jevbratt in the *1:1* project, and will list further work from the corporation as sample units in its data. Brett Stalbaum—whose article on contemporary database practice in the arts (2004a) was already mentioned in this study—happens to be, along with founder Joel Slayton and collaborators Steve Durie, Geri Wittig, Jack Tooling, Bruce Gardner, and Amul Goswamy, a member listed in the last formation of *C5 corp* personnel referred in the "Corporation's Website".

In the project's section of the *C5 corp* Website, is stated that *C5* makes no distinction between the research ambitions of business and art, that the opportunity to conduct

research contextualized by both fields is unique of *C5's* culture, and that the emergent theory of said efforts serves to define conceptual methodologies, techniques and strategies appropriate to both worlds.

Wilson (2002:842) refers that Slayton and his collaborators have created a corporation/research-organization dedicated to the pursuit of new developments in technology, theory, and art. He adds that *C5* presents the full regalia of a corporate structure, including the finance, governance, marketing, and the research elements. Its *Theory as Product* motto, as stated in the corporation prospectus, places its specialization in cultural production informed by the blurred boundaries of research, art and business practices.

A bio of the artistic corporation published in *The Art, Technology, and Culture Colloquium,* at the *UC Berkeley's center for New Media* in 2001, on the occasion of a talk named *Data and its Discontents,* states that the San Jose's *C5 Corporation* was founded in 1998, that it is structured as a Limited Liability Company that provides a unique context for research in information visualization, creating models and analysis of networks and systems in which the generation of data informs its interpretation.

The *C5 corp's* Website project section lists seven projects developed between 1998 and 2006, and six of them are part of the study's overall database. Another one, named globally as *The C5 Landscape Initiative,* being in fact a combine of three different projects, plus a fourth related *GPS Media Player* project, will be described as part of the study's data as well.

The project's description reads that the series of projects developed under the umbrella of the *C5 Landscape Initiative* were initiated in 2001 and involved mapping, navigation and search of the landscape using the *Geographic Information Systems.* The project takes place over a period of five years, and it is stated that the work was done as an extension of *C5*'s exploration into data visualization systems as art. It examines the changing conception of the Landscape as we move from the aesthetics of representation to those of information visualization and interface.

C5 acknowledges the availability of instrumentation capable of creating a detailed mapping of the surface of the Earth from space and that like the mapping of the human genome, the scope and implication of such mapping asks for tremendous social, political and economic considerations, and that the conception and interaction with the Landscape is becoming an issue of the database.

The context in which *The C5 Landscape Initiative* was created is described as implying a set of new discourses and disciplines that have emerged from diverse fields of investigation, such as: Interactive Mapping and Archeological Geophysics, new data products resulting from the technology transfer from GIS research and present in Environmental Studies, strategic management of resources and hazards and disaster analysis. The emergence of an entirely new relationship with the Landscape is taking form in applications for simulation, surveillance, resource allocation and management of cooperative networks that the technologies of Spatial Data Systems and Global Positioning Systems have enabled.

It is in this context of technological global probing and all the quoted collateral implications that the *C5 Landscape Initiative* sets as its objective to make available open source software, and to allow anyone to pursue the trajectories enabled in the series of the *Landscape Initiative.* Referring to this project, Paul (2005) states that it is positioned in the overlapping zones of Conceptual Performance, and Land Art, as well as research, business and exploratory adventure. Therefore the project raises questions about the contexts in which meaning is constructed and about the status of exploration in art itself.

The Analogous Landscape: Rim of Fire, 2001, is the first project in *The C5 Landscape Initiative* and is described in its Website page as focusing in defining the nature of resemblance between things that are otherwise unlike. From the description text we learn that with a research agenda in the fields of adventure sports, corporate culture and art, *C5* intends to create a large scale Conceptual and Performance work in the tradition of the monumental pieces by environmental artists such as Robert Smithson, James Turrell, Christo, Richard Long, and the Harrisons.

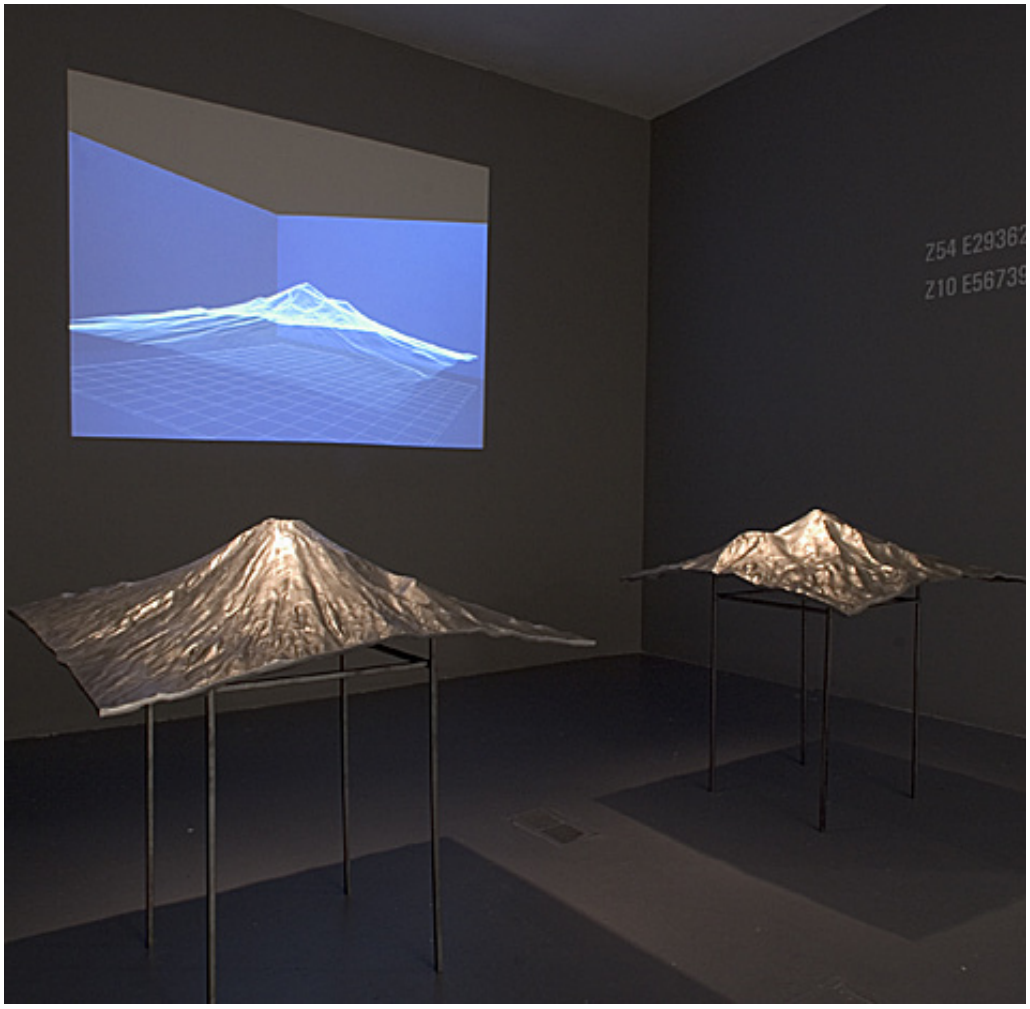

Fig. 72: The Analogous Landscape: Rim of Fire (C5 2001).

The Analogous landscape section in the *C5 Landscape Initiative* debut exhibition at the *San Francisco Camerawork Gallery* in 2005, features two sanded and waxed aluminum models of the Mount Fuji and the Mount Shasta standing at a table height in front of a projection of the 3D data used to build the models. There is a time-based unfolding of the route C5 took to climb each analogous landscape using their actual GPS data from the climb, a series of PDAs, displaying texts, images, and animations made as field mediations during the different projects, hang from a wall where is also printed the text "Analogous Landscape, Inferencing is a Social Action" (Dietz 2005).

Fig. 73: The Perfect View (C5 2003).

The Perfect View, C5's 2003 *Landscape Initiative* iteration, is described as an exploration of sublimity. The project takes advantage from the growing number of people who uses GPS devices for recreational exploration, and asks its participants to supply for the geo-caching of the US locations that they thought as being sublime. After the collection of the coordinates of the latitude and longitude provided by the respondents, Jack Tooling, a C5 member, used that information as data points for an expedition trough thirty-three States, along a thirteen thousand mile motorcycle ride, as well as the photographic subject matter for the project.

In the project's description we can read that starting from San Jose, California, Tooling visited and documented twenty-five sites, extending from the West Coast to the East Coast, and from Texas to Michigan, whether traveling alone, camping and moteling for most of the trip, he occasionally spent time with the geocache enthusiasts who recommended the sites and witnessed their excitement about exploration, discovery, and the camaraderie they share with fellow adventurers.

It is stated that the choice for sublimity as a theme or criteria for the site selection was due to parallels between the rise of Landscape Art as a genre during the Industrial Revolution, and the interest in exploration in our technological revolution. Moreover, the phenomenon of sublimity in Western civilization reaches at least far back to Classic Antiquity presenting as examples the assertion for affective literature by the Roman philosopher Longinus; the expression of the sublime through religious iconography by Renaissance and Baroque painters; and the pondering of

the impact of the sublime through encounters with the extraordinary by the 18th Century philosopher Edmund Burque.

It is then argued that while in the late 20th Century landscape was largely subordinated to the predilection of Postmodernism towards meaning and culture, there is currently a renewed interest in landscape. this comeback of the Landscape may be due to the following reasons, here speculated as possibilities: a reaction to the hegemony of computer technology and the accompanying emphasis on virtual space; economic and political tumults sparking the desire for relief; as a reaction to the Postmodern irony.

The statement's last section asserts that the interest in Landscape amongst the *C5* stems from a fascination that drives the collective to study how people interact with data, and how data influences the way people interact with the environment. It further suggests that the increasing availability of Geographic Information Systems technology to the general public provides a fertile field for this kind of work, and that sampling the sublime through this technology is the basis for *The Perfect View.*

An exhibition of *The Perfect View* at *The Project Room* at *Chelsea Art Museum* in 2010, designates the exhibition as an experimental geography. There are featured six large-scale triptychs documenting the sites and consisting of large-scale photographs, satellite imagery, and computer generated renderings, providing for distinctly technological ways of representing topography; video documentation presenting interviews with three of the 'geocachers' who contributed with sites for the project; the expedition artifacts; and *The C5's GPS Media Player* presenting some of the expedition routes GPS 'tracklogs', as well as photographic and video documentation associated with them (Colosi 2010).

The connection between technology and exploration is expressed once again, whether stating that the project addresses parallels between technological and philosophical undertakings from the Enlightenment and modern technology, or underlining the engagement of a large community of users whose relation to GPS technology is due to the allure of exploring little-known locations in the natural world.

The Other Path, from 2004, illustrates *C5*'s interest in paths of significant historical, cultural and strategic implications throughout the world, and examines particularly the path of the *Great Wall of China.* The project's description states that *The Other Path* main purpose was to describe the twin other of this significant path. It explains that in a first phase of the project, they used GIS technology to map the *Great Wall of China* in an expedition that took place in the Spring of 2004. The GPS data collected from twelve separate trekked locations along the *Great Wall,* were then used to develop pattern-matching search procedures for locating the most similar data model in the most similar terrain in California. It was thus created an American counterpart of the original path, made possible through the identification of terrains expressing similar statistical characteristics. This second phase of the project used a swarm of virtual hikers *unleashed* in the virtual California landscape, and implemented as experimental features of *The C5 Landscape Database Application Interface.* The generated tracklogs were uploaded to GPS devices and physically explored in a *C5* Performance named the *Great Wall of California.*

The body of work of *The Other Path* Installation at the *C5 Landscape Initiative* exhibition at the *San Francisco Camerawork,* included computer visualizations of the path search, as well as photo and video documentation projected onto topographic maps of China and California, etched on glass.

The *C5 GPS Media Player* was the featured project on *The Whitney Museum*'s Net Art Portal in 2005. It was developed in conjunction with *The Landscape Initiative* and basically works as a visual interface to all the data generated in *The Landscape Initiative* and stored in the *C5 Landscape Database.* On the description of the project is written that the Web application provides the ability to navigate and display the GPS tracks and their related media, and enables a comparative analysis and filtering, through specific variables such as a person, a project or an event. It is also added that more than a mere interface to the database, the *GPS Media Player* creates an implicit timeline and metanarratives for each of *The Landscape Initiative* projects. It provides means to simultaneously document their beginning, data and process, and to present a synched visual-data record of their trips (Dietz 2005).

Fig. 74: The Other Path (C5 2004).

The C5 Landscape Initiative debuted in an exhibition curated by Marisa S. Olson at the *San Francisco Camerawork Gallery* in 2005. The exhibition's presentation text reports that *The C5's Landscape Initiative* is the culmination of a three year period of research and documentation of performative expeditions into the landscape. The records were made through Geographic Information Systems and Big Data analyses, presented through database software developed by *C5.* The features include digital photographic prints, fabricated sculptural objects, 3D visualizations, and digital video that explore, navigate, and map the landscape of the globe. The same text informs that the viewers are invited to interact with C5's expeditions while exploring their relationship to the land in a data-driven world.

The C5 Landscape Database Application for Digital Elevation Model processing and performance, as used for example in *The Other Path,* was released to the public in association with *Futuresonic* in 2006, as a celebration of the 10th anniversary of *Futuresonic.* The application was developed as an auxiliary effort to support *C5*'s projects, performances, and software enabling the interaction with Digital Elevation Model data and GPS technology for training and performance art. In *The C5*'s *Landscape Database* page it is written that their research into GIS and GPS systems

incorporates their interest in self-organization, social networks, and surveillance, along with their expertise in knowledge engineering, data visualization, autopoietic theory, mingling theory, database, and tactical/collaborative/situational systems and analysis. It is also stated that the project aims at a redefinition of the GIS application, to create software tools with practical applications in Conceptual Art and tertiary exploration of the face of the earth, that is defined by the *C5* as a mode of exploration that comes after initial exploration and secondary data modeling.

The diverse nature of their projects, working materials, and processes reflect a distinct mixture of the research in Science, Performance Art, and Sports. The group combines an interest for outdoors' recreation and land use such, as Hunting, Fishing, Performance Art, Off-Highway Vehicles' use, Land Art, and other team/collaborative activities which include a wide range of sporting events such as Cycling and Endurance Racing.

The public release of the *Landscape Database* application reflects Stalbaum's (2004a) previously discussed interpretive framework for contemporary database practice, as a database formalism. This approach is best demonstrated by the interest in the actual materials modeled by data, as well as by the quest for new exploratory methods of interacting with the material world. There is a demonstration of a new knowledge about the materials, about the possible interactions with them, and about how to allow the data to be cooperative co-participant in the Performance. Stalbaum (2004a) states that database formalism, understood as one of the modes to interpret contemporary database practice, along with database politics and data visualization, is a tendency in which the database is conceived as a virtual context for implementing a data-cooperative mediation of the world. Its goal is to realign the power of database to distribute the real, while conceiving the agency that is returned back to the hands of the people who interact with such systems. Individuals are thus encouraged to develop related expertise and to produce ecologies of knowledge, whether for political or apolitical ends. He also adds that the database formalist mode allows the aesthetic analysis to move towards and to explore truly interesting, but purely formal issues of database as a medium. The relational database model's ability to maintain *ad hoc* queries may be consequential in terms of how the material world is ultimately mediated in particular instances.

The following set of sample units in the study's data is a selection of specific artifacts picked up from the study's global database, from authors not mentioned in the particular contexts previously explored but whose work is relevant to the study's data heterogeneity.

Live Wire is a project made by Natalie Jeremijenko, presented in 1995, and is also known as *Dangling String*. The piece is an eight feet dangling plastic wire attached to an electrical motor. This engine is connected to an Ethernet transceiver that moves proportionally to the number of packets transmitted through the Network. Its text description states that the device is a shared social display of information, in which the dynamic behavior of the wire becomes an intuitive peripheral representation of the Network activity.

Weiser & Brown (1995) refer to the *Dangling String* as a radically new tool that shows the ordinarily invisible bits flowing through the wires of a computer Network, through motion, sound, and even touch. According to that text, the work communicates both light and heavy Network traffic and its output is so beautifully integrated with human processing of information that one does not need to be looking at it, or near it, to take advantage of its peripheral clues. Characterizing its unobtrusive presence Weiser & Brown state that the *Dangling String* meets a key challenge in technology design to be resolved in the next decade, which is how to create what they designate as "calm technology".

The notion of calm technology relates directly to their notion of periphery, that is used to name what we are attuned to, without being explicitly attending to. Referring to the *Dangling String* as an example of calm technology it is stated that, at first, the piece creates a new center of attention by being unique, but that soon this center of attention becomes peripheral. This change is motivated by the gentle waving of the string moving easily into the background, and because it it can be both seen and heard, provides increasing clues for the peripheral attunement.

Fig. 75: Live Wire (Jeremijenko 1995).

Jeremijenko (1997) describes the project as a material manifestation of Cyberspace, as something that instead of being something else in the users' face, is in the periphery of the shared physical space. In this sense, it is more tacit information rather than the precisely graphed, or a data fetishism of the information rhetoric. She also states (2000) that the best proof of this tangible strategy of representing information was that the *Live Wire* was the only piece that Jeremijenko ever produced that the system's administrators really liked. A probable reason for this approval is that there was no more people banging on the administrators' doors asking what was wrong with the Network, as all needed answers were rendered obvious by the piece. Vande Moere (2005) locates this work as the earliest example of (electronic) ambient visualization, because in its physical and socially shared location, *Live Wire* turns data flux into motion materiality through an act of energy transduction.

Statistical Clock, by Anthony Dunne and Fiona Raby, with Michael Anastassiades, is a speculative Design object, and part of the project *Do you want to replace the existing normal?*, developed in 2007 and 2008. The text description of the *Do you want to replace the existing normal?* explains that Design is unable to create our needs and

desires, but only capable of following them. And if those desires remain unimaginative and practical that is how Design will be. The text also explains that with their project they hope to instigate future, more complex and subtle everyday needs. For that reason, the collection of objects in the project, perhaps utopian but patiently in wait, is designed in anticipation of that time or, according to Debatty's words (2007), designed for complicated or irrational needs.

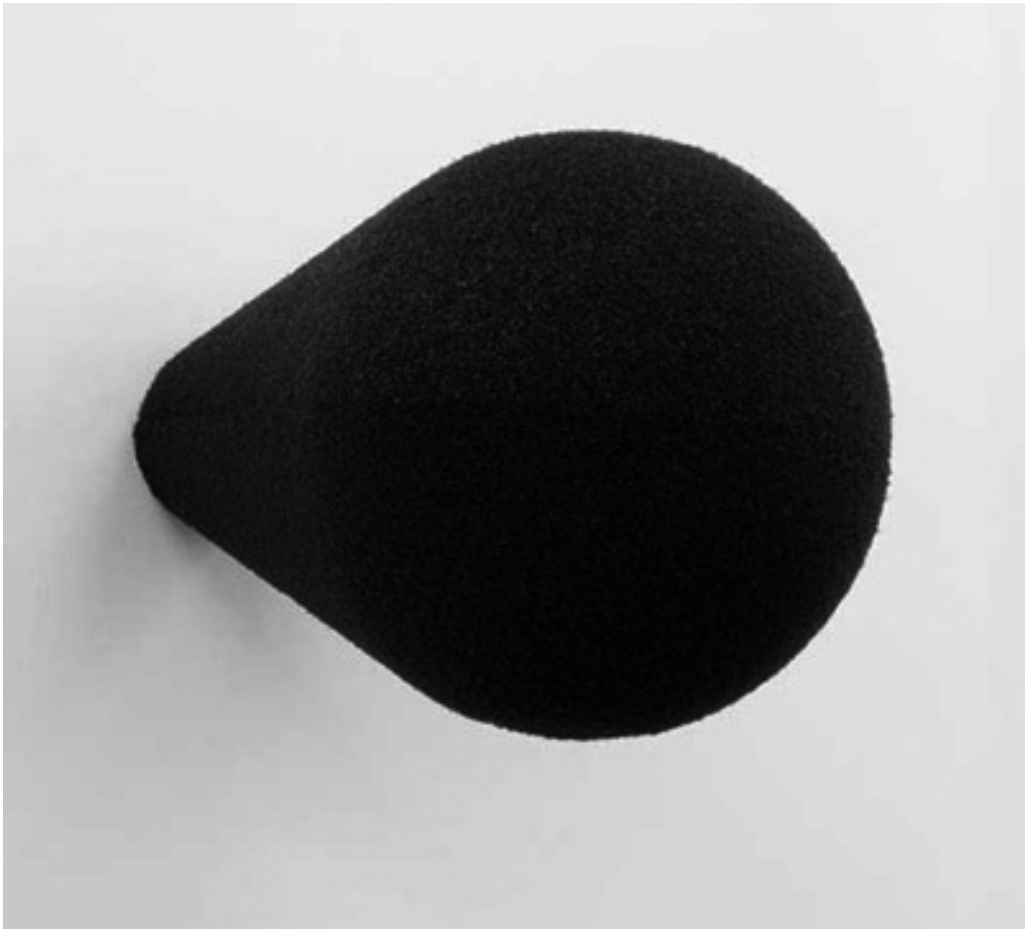

Fig. 76: Statistical Clock (Dunne, Raby and Anastassiades 2007-2008).

The Statistical Clock is a foam and electronics device, similar to a microphone, but doubling as a speaker, that connects wirelessly to the Internet. It scans the *BBC News'* feeds searching for data related to technological mediated fatalities—car, train, or plane crashes or other incidents—which it pulls into a database. Each technology has attributed its own numerical channel. The clock checks its source periodically and, if it finds a new occurrence, it then speaks it out loud numerically… 1, 2, 3.

Debatty (2007) states that the way the object works was partly inspired by the experience of listening to the *Number Stations* featured in the *Conet Project.* These stations would transmit in short wave and would usually feature female voices reading streams of numbers, words, letters, tunes, or Morse code. Debatty (2007) suggests that they were probably used by spies in very specific time contexts, in which these numerical streams would make sense.

Debatty (2007) also adds that the object is meant to re-sensitize oneself towards such type of events that seem to have lost any impact due to media over-exposure. Being so, the feeling of listening to the clock reconnects us to the reality behind statistics and genuinely gives meaning back to something that we take for granted.

Fallman (2008) refers to the techno-critical digital art by Dunne & Raby as provoking and criticizing the current state of affairs. This is stated to fulfill the previously discussed design exploration characteristic to comment on a phenomenon by bringing forth an artifact that often by itself, without overhead explanations, becomes a statement or a contribution to an ongoing societal discussion. As was discussed previously in the study, the *Statistical Clock* also fulfills the design exploration typology in Fallman's model, as a piece of design that rather than being driven by how well the product fits into an existing or expected future market, or the observed needs of a group of users, becomes a statement of what is possible, of what would be desirable and ideal, or just to show alternatives and examples (Fallman 2008). Fallman further adds that in this way, the activity of design exploration is clearly linked to some of the ideals of contemporary art, as well as to the interpretative attitude of many disciplines in the Humanities.

As previously referred, *I/O/D 4: The Web Stalker,* by *I/O/D*'s Mathew Fuller, Colin Green, and Simon Pope, from 1998, is a browser developed by a team of programmers and artists. According to Heike Helfert (2004) the project settles between technological development work and art, and imitates the structure of the Internet demonstrating a simple and reduced alternative to Netscape and Explorer as a mechanism that can be used to investigate the structural depths of the Web.

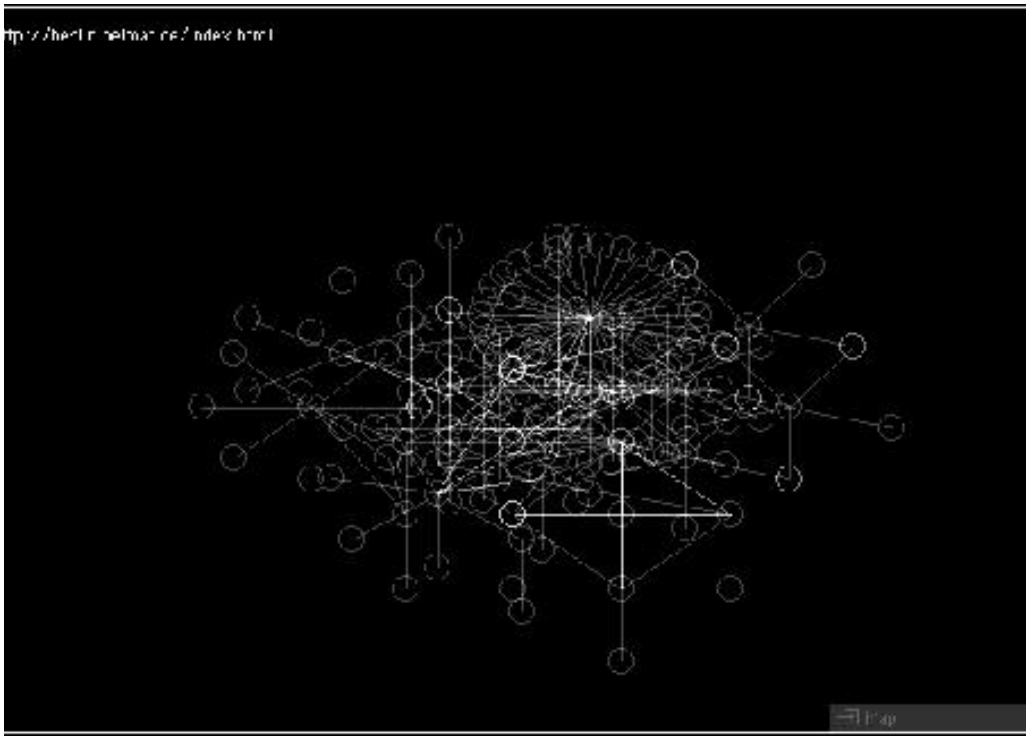

Fig. 77: I/O/D 4: The Web Stalker (Fuller, Green and Pope 1998).

Bosma (2004) refers to *The Web Stalker* to contextualize Software Art in relation to Burnham's (1970) explanation of Software as an attempt to produce aesthetic sensations without the intervening object. She agrees that *The Web Stalker* is an alternative Web browser that does not display the Web Pages as commonly expected, but rather visualizes the underlying HTML structure of the Web presenting the code in a highly aesthetic manner: delicate lines erupt on the page to form stars of connected nodes in a web. As a piece of software, Bosma considers that *The Web Stalker* is more about revealing the way a browser works, exposing the way commercial browsers frame the user's view of the Web by letting their working capabilities being determined by the needs of advertisers and corporations, rather than experimenting with the format of the Web (Brown 1997).

Galloway (1999) refers to *The Web Stalker* as a *carnivorous* browsing application and as a software art predecessor of other artist tweaked and twisted tools to surf the Web, such as the previously mentioned *netomat™*. Frieling (2004) refers to *The Web Stalker* as probably the most frequently cited mapping project in Internet Art, and

as an alternative browser that can present the static link structure of any website as an abstract image. This image can be compared with other structures allowing for correlations that are immediately recognized.

Lovink (1998) refers to *The Web Stalker* as showing us the backstage of browsers and asks the authors if the project is a bit pro-Protestant, in the sense of anti-image and pro-code, and a step-back for the normal user. In his opinion, this happens because the project presents a hacker-like version of the Web without the easy-to-use interface. Fuller (Lovink 1998) replies that the *Web Stalker* is a 'speculative software', since it tries to uncover hidden aspects of the Web and promotes other potential cultures for its use. This is accomplished beyond the aesthetic conventions of commercial browsers and calls for the development of a different relationship towards beauty.

Paul (2002, 2007), referred to *I/O/D*'s *The Web Stalker,* in conjunction with Maciej Wisniewski's *netomat™,* Andrew Kerne's *Collage Machine,* and Mark Napier's *Riot,* designating the reconfiguration of the browser and its function that these projects operate, as Browser Art—a new sub-genre of Internet Art that is mapping the Internet in its own way. Moreover, she added that *The Web Stalker* alone establishes the 'medium' of alternative browsers. These revealed the Internet's "database architecture" as an aesthetic form by exposing its internal structure. The author completed her reasoning stating that both, *The Web Stalker* and Wisniewski's *netomat™,* deploy their own 'database aesthetic' since they reconfigure the interface and front end that allows us to experience the myriad of files in the Internet's database.

The study already referred and described *Carnivore,* created by Alex Galloway and the *Radical Software Group* in 2001, in the context of two of its client-projects: *PoliceState,* by Brucker-Cohen, 2003, and *Out of the Ordinary,* by Jevbratt, 2002. *CarnivorePE* is inspired by DCS1000, DCS stands for Digital Collection System, a software used by the FBI in electronic wiretaps, and better known by its nickname "carnivore". *CarnivorePE* is an open source artistic and improved version of the FBI's sniffing software, which was made available by *RSG* and used in artworks such as the ones referred above.

Frieling (2004) refers to *Carnivore* as an example that demonstrates the political interestingness of pursuing and archiving a net-user's tracks through data-mining, and aggregates it with for example, Jevbratt's *1:1,* as contributions to mapping the Internet's "Big Picture". Paul (2007-97) refers to *Carnivore* as effectively capturing the tension between the Internet's inner data structure or stream and all the possible visual forms that it can generate on the surface. The author ties-in the tension between what she states to be the mostly linear and hierarchical structures of databases and instructions, and the infinite possibilities for reconfiguring the information they contain. The twenty-four *Carnivore clients* by different artists are listed in the project's website. These artworks interpret the stream of the sniffed data in diverse ways, thus illustrating the unlimited possibilities of visualizing a server data stream and the relationship between the back end of data and its front end incarnation.

Paul (2007:97-98) also highlights the political statement inherent in the relationship between client and server, taking data as a metaphor for artistic creation, which is brought forward by the project *Carnivore*. Therefore, the questions of access and control captured by the implications of client-server relationships are in direct opposition to the peer-to-peer promise of liberation from the server and its becoming of a philosophical and political issue.

Sack (2006) refers to *Carnivore,* stating that the piece works because it draws attention to the fact that the United States Intelligence agencies spy on network traffic. The general public expresses the fear of being profiled and having personal data copied or doubled, resonating a dread with the dismemberment of the identity that characterizes Freud's (1919) *Aesthetics of the Uncanny,* as Sack puts it.

Manovich (2002) compares the diversity of forms driven by the network data and explored by the many *Carnivore* clients to the modernist artists in the first decades of the 20th Century who mapped the visual chaos of the metropolitan experience through purged geometric images. They were thinking about the data visualization as a new abstraction in which the same dataset drives an endless variation of images, reducing the quantitative data to its patterns and structures. Those artists were interested in exploring these forms while creating rich and concrete visual representations. The author also asserts that the clients of *Carnivore* developed a set of

manageable visual objects fitted inside a single browser frame that maps the macro and the micro and the infinite and the endless, thus transforming the invisible and "messy" phenomena of the flow of data packets through the network into ordered and harmonious geometric images.

Fig. 78: Hello, Weather! (Polli & Varga 2008).

Hello, Weather!, developed by Andrea Polli with Chuck Varga in 2008, consists of public weather stations that gather the weather and climate data that then is made accessible to a broad range of specialists from diverse areas. The project's description text states that its scope aims at bringing together artists, technologists, ecologists, and environmentalists around the international phenomenon of personal weather stations to engage their sensibilities into working with the real-time data that is made available.

The weather stations in the project are self-sufficient solar-powered do-it-yourself assemblages located on the rooftops of the buildings. The stations transmit their data wirelessly to an indoor receiver, where it is logged, uploaded to a computer, and obtainable in various formats from several weather websites. The project's website

refers that, at the time of the *Hello, Weather!* launching, there were five professional weather stations in operation, two of them in New York city, one in Los Angeles, one in Zurich, and one in Delhi.

Hello, Weather! focuses on raw data awareness and its dissemination among interested specialists and the general public. As it can be read on its website headline, *Hello Weather!* attempts to de-mystify the collection and use of weather and climate data, as well as to investigate cooperative media in the context of weather and climate observation and science. The data gathered is then fed to other agents to explore, and this makes *Hello, Weather!* a project seeder and a catalyzer for a multiplicity of eclectic approaches.

Perpetual Storytelling Apparatus, made by Julius von Bismarck and Benjamin Maus in 2009, is a data driven storytelling drawing machine that correlates keyword text from bestselling books with a database of several million patent drawings and cross-references from the *United States Patent and Trademark Office.* The machine outputs a continuum of plotted patent art resulting from the established dialogue between the parsed text from the novels and the stream of illustrations detailing an array of technical descriptions.

In the project's website basic procedure report it can be read that the program operating the machine starts by downloading and parsing an excerpt of a recent best-selling book. Next, the algorithm eliminates all the insignificant words such as "I", "and", "to", etc., and defines the remaining words and their combinations as the keywords for the patent drawings. Then, it searches for key-patents using the keywords in chronological order and looks for a path connecting the found key patents through references to older patents in the "prior art" term. Finally, all the key-patents and the patents are connected semantically, arranged and printed, and the program is ready to repeat its cycle again.

The original input data is stripped from its context, preserving only its chronology. The same procedure is applied to the extracted illustration figures, whose original frame of reference looses ground in light of the creation of this new weaved stream of visual imagery. The storytelling device operates an act of translation starting

from the individual written imaginary into the collective bank of human illustrated inventiveness laying in the patent's database.

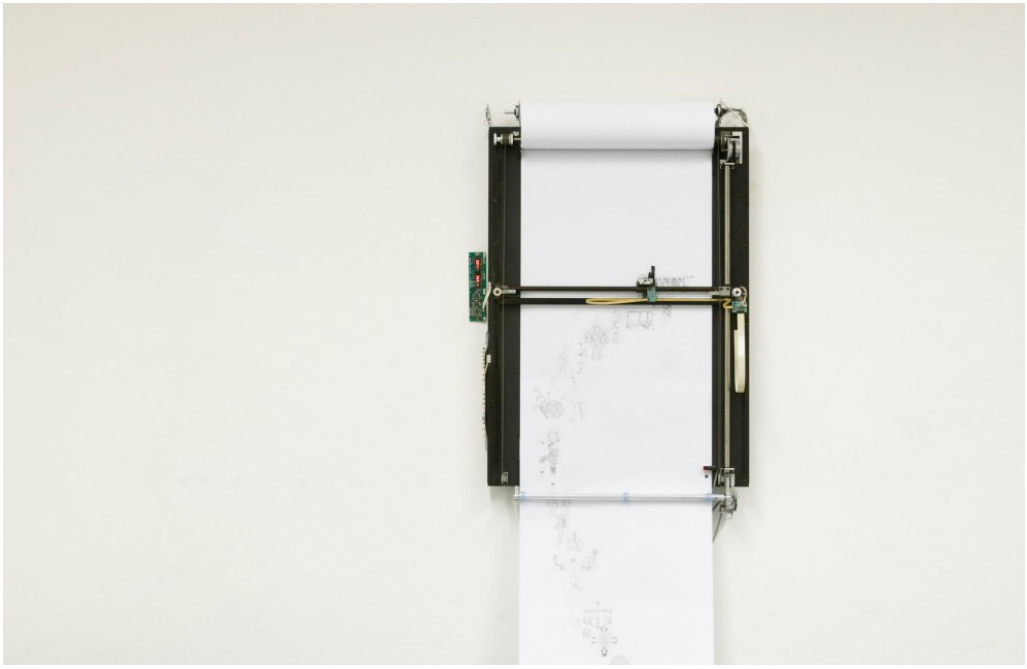

Fig. 79: Perpetual Storytelling Apparatus (von Bismarck & Maus 2009).

Smith (2010) refers that von Bismarck & Maus highlight how the patents are a reflection of the mindset of society in a certain time in history, stating that a strange tension between the patent documentation and the actual history and social culture of technology is at the heart of their drawing machine.

Listening Post was developed by Mark Hansen and Ben Rubin between 2002 and 2005, and is described at its Website as an Art Installation that appropriates in real time text from thousands of unrestricted Internet chat rooms, bulletin boards and other public forums. The collected words are parsed, sorted and analyzed in order to be read by a voice synthesizer, and simultaneously displayed across a suspended grid of 231 vacuum-fluorescent screens (Rubin 2010).

It is stated that the piece cycles through six different movements with its own data processing logic that outputs different arrangements of visual, aural, and musical

elements, and that *Listening Post* is a visual and sonic response to the content, magnitude, and immediacy of virtual communication.

Hannah Redler (2008) made a curatorial statement at the opening of *Listening Post I/III* Installation held at the *Science Museum* in 2008, and quoted Michelle Kasprzak (2005) describing the project as a monument to the present, because the piece depicts the sound of 100,000 people chanting. According to Hart (2010) Rubin stated that they wanted to know how the sound of all online chats was if heard all at once, and how it could be synthesized into a poetic artwork that would remain true to its data source.

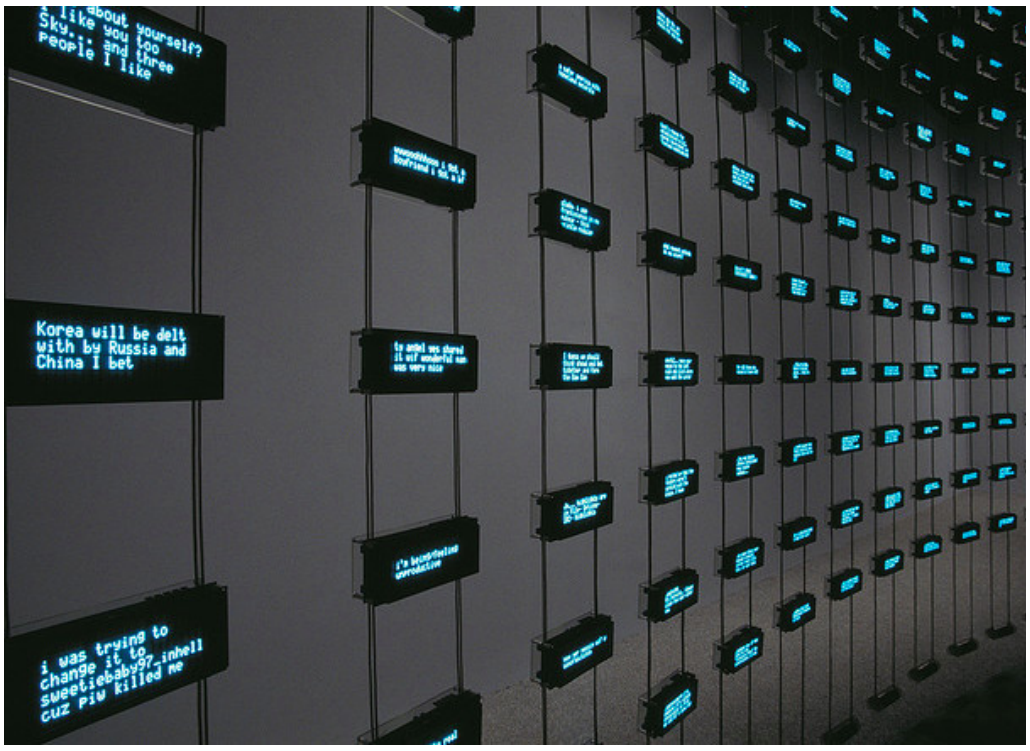

Fig. 80: Listening Post (Hansen & Rubin 2002-2005).

Hart's (2010) article reads that the project's networking, language processing and analysis is written in the Perl programming language, and that the audio, processed through the Max/MSP programming environment, is played through a Kurzweil K2500 sampler, eight speakers, and a Yamaha DME-24 that mixes and processes the audio. The vacuum-fluorescent screens are equipped with an individual custom

control circuit board running off a PIC chip, and have automotive relays that emit the mechanical 'click' and fluttering sounds that punctuate the piece.

The Science Museum's *Listening Post* text description designates it as a 'dynamic portrait' of online communication that allows its audience to experience an extraordinary snapshot of the Internet and gain a great sense of humanity behind the data. The project is seen as a monument to the ways human beings find to connect and express their identities online. Redler (2008) states that the power of *Listening Post* emerges from the artists' skill in combining their philosophical, artistic and technological interests. This enables an exceptional distillation of collective interests as well as the content and patterns evident in different information channels, collected, sampled, and processed through Hansen's computer programs. Those materials were processed musically through Rubin's synthesizers that responding to the shifts in the data streams, build up the musical score. The resulting piece goes far beyond the mere redisplay or reinterpretation of data patterns, while expressing the meaning of data gathered from the Internet.

Whitelaw (2007) arguing about data as the raw material of information, quotes Hansen & Rubin (2001) accepting the distinction between the two terms. Whitelaw further informs that when those authors write about their sonification work in Lucent's Web site and the sonification of a large number of Internet chat sites in real-time that would derive in the *Listening Post* Installation, they make clear that there is a strong intent to explore the information hidden in the data.

Erkki Huhtamo (2004) discusses the awarding of the *Listening Post* with the *Prix Ars Electronica's Golden Nica in Interactive Art* in 2004, and states that people described their experience of that project in near-religious terms: meditative, sublime, elevating, hypnotic and captivating. The audience also remarked that it was easy to lose the track of time and forget the surroundings, being lulled into a trance-like state by the artwork. Highlighting the disputable legitimacy of the *Listening Post*'s interactivity, Huhtamo (2004) states that perhaps a new category should be created for works like that one. He argues that *Database Aesthetics* might be a viable candidate, as it would by-pass the limitations of concepts such as user interaction, passive interaction and system interaction adopted by the jury of the prix *Ars Electronica*

2004 while addressing the expanded definition of interactivity. Huhtamo further predicts a future wave of database-related work, which would better contextualize the *Listening Post.*

Hansen & Rubin's *Listening Post* was exhibited at *Decode: Digital Design Sensations,* 2009-2010, at *The Victoria & Albert Museum.* In its text description it can be read that the exhibition showcases the latest developments in digital and interactive design, including works by established international artists and designers exploring three themes: Code, Interactivity, and Network. The Network category, described as focusing on the digital traces left behind by digital communications, new types of social interaction, and new mediums of self-expression, included the referred *Listening Post* Installation, and also as part of the study's data, Aaron Koblin's *Flight Patterns,* 2006, and Karsten Schmidt & Sascha Pohflepp's *Social Collider,* 2009.

Flight Patterns (Koblin 2006).

Flight Patterns, by Aaron Koblin, 2006, shows a video animation of twenty-four hours of airplane data tracking flights in the United States, provided by the *Federal Aviation Administration.* The project, a collaboration between Koblin, online flight information service *Flightview,* and *Wired Magazine,* uses real-time data to illustrate specific aircrafts, comparing the differences in flight patterns between the ten most active aircraft models into a colorful weave that traces the shape of the United States. Hart (2010) states that every three minutes the location of the flight routes

were transmitted to Koblin, who interpolated them to create the video animation. It quotes Koblin interest into seeing the way the *Flight Patterns* characterized the country's spinning daily rhythm routine from dawn to sunset, visible in the ebb and flow as planes' routes erupt on the East Coast in the morning, and flow over to the West Coast and Hawaii.

Social Collider, by Karsten Schmidt and Sascha Pohflepp, 2009, was commissioned by *Google* for their *Chrome Experiments'* collection and is described on its project Webpage as a Javascript visualization that reveals cross-connections between conversations on the Twitter social network. The statement informs that the project tracks the messages by user names or topics, and visualizes the connections in the same way a particle collider draws pictures of subatomic matter. The text also presents *Collider* as acting as a metaphorical instrument that can be used to expose the way memes get created and propagate, ideally catching the *Zeitgeist* at work.

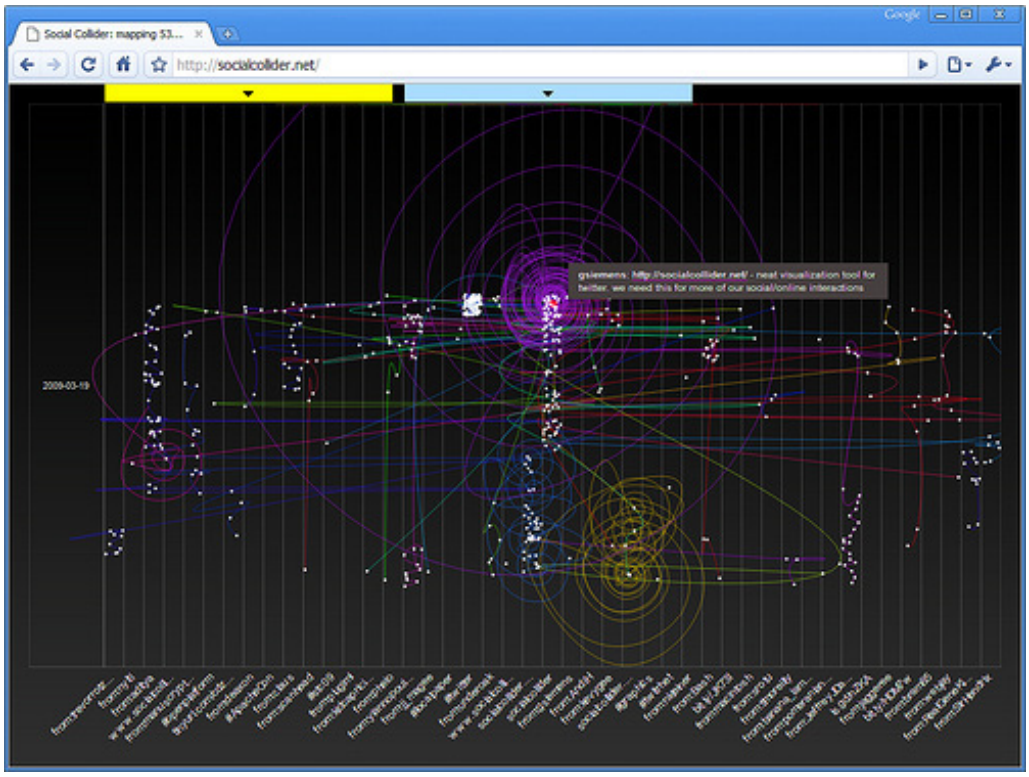

Fig. 81: Social Collider (Schmidt & Pohflepp 2009).

The authors state that both temporal and lateral perspectives on the data-trails that we are constantly producing are underrepresented, and if we look at those data-trails through time, we can have a glimpse of a whole world of contexts and astonishing relationships.

Schmidt (2009) states that they narrowed down a Pohflepp's general visualization idea to show their personal data traces in context or contrast to lateral things that could inadvertently and unconsciously influence their moods and actions. Their option for the Twitter platform as a source of data is justified by the heterogeneity of topics discussed, the real-time granularity combined with the *ad-hoc* discussion element, the personal contexts, opinions and feedbacks to the 'data', and the socially widespread nature of the conversations.

Schmidt (2009) finds that this project also aims to fill a current niche characterized by a visualization that was supposed to give a qualitative overview over a macroscopic picture of the activity on Twitter by attempting to trace how content and memes spread through the network.

Field-Work@Alsace, by Masaki Fujihata, 2002, is part of *Field-Works,* a major piece started in 1992. In its webpage is described as a series of projects that reconstruct collective memories into cyberspace as a kind of video archive by using its position-data captured by GPS.

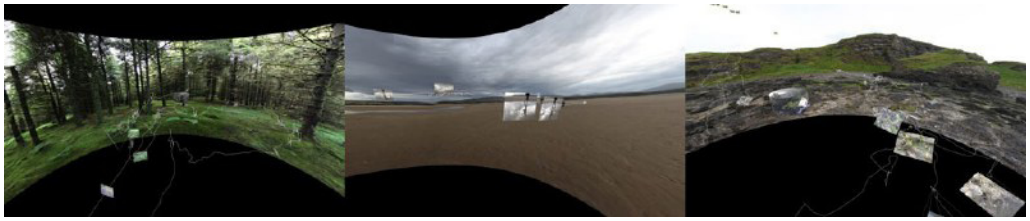

Fig. 82: Field-Work@Alsace (Fujihata 2002).

The Alsace Field-Work is a collection of interviews with locals and travelers around the Alsace border between France and Germany. The project, developed in August and September of 2002 with the support *ZKM-Center of Art and Media* in Karlsruhe, Germany, shows the whole interviews located in the place where they took

place and replays them across space and time according to the original camera motion on location.

The webpage at the *ZKM*'s *Future Cinema* exhibition in 2002, describes the project as an interactive multimedia Installation and credits Takeshi Kawashima as the project's co-author. The description reads that the interactive Installation *Field-Work@Alsace* deals with the representation of time and space dimensions in the moving image. Combining video with GPS positional and directional data, the artists provide a topographic and temporal system of the coordinates of Alsace that then is translated into a virtual 3D space and enables the viewer to follow the images and their traces experiencing the complexity and interconnectedness of space and time (Shaw & Weibel 2003).

Fujihata (Shaw & Weibel 2003) states that this system records place, time, visuals and camera orientation all at once, and the cumulative positional data registers as white lines in space representing GPS data connected over time and containing the geo-located video segments of the interviews as content nodes across the space and time of the lines.

The main focus of Field-Work@Alsace lays on questions such as how the creation of new media brings new aspects to the work, and to the visuals made by those means, and what limitations and possibilities do they impress upon the image-maker (Shaw & Weibel 2003:417). Fujihata adds that the will to record location data along with the video footage relates to the way the act of photographing typically crops images from reality and trims the particular 'locality' of the images through editing and reassembling them in other contexts. The conflation of both time and space events in one particular common experience deals with the author's acknowledgment of the difficulty to convey events from memory to others, and the need to go beyond explanation by providing the ultimate meta-explanation of experience (Shaw & Weibel 2003:417).

Manovich (2008:85) refers to Fujihata's Field Works in the context of media hybrids and explains that they place video recordings made in particular places within a highly abstracted 3D virtual space representing the place. Therefore Fujihata pio-

neered 'locative media' work with his Field Studies in the 1990's, a decade earlier before the term made its appearance, having to build its own custom hardware in a time when cameras with built in GPS were not yet made available to the public.

Manovich (2008:86, 87) adds that *Alsace* represents a particularly interesting media hybrid as it fuses Photography, Video Documentary, Locative Media, 2D motion and 3D orientation, within a 3D virtual space. The result is a new way to represent collective experiences in an overall immersive coordinate system in which the author found a simple and elegant way to render the subjective and unique nature of each video interview. He achieved this by situating each rectangle container at the particular angle that actually reflects the original position of the camera during the interview. Manovich also underlines the fact that even after *Google Earth*'s turning 3D navigation of space containing photos and video of a common experience, Fujihata's *Field Works* continue to stand out as they show that to create a new kind of representation it is not enough to aggregate different media formats and techniques, but rather systematically question their conventions and change their structure in the process.

On notion of metadata—the data about data that allows computers to locate and retrieve data, moving it from one place to another and connect it with other data—Manovich (2002b) refers that the project of 'metadating' the image is a new paradigm to interface reality and the human experience. This has been already demonstrated by a number of successful art projects like Fujihata's *Field-Work@Alsace* in which the focus is on new ways to access, describe and organize large number of visual records and at the same time proposing new types of images, or generically, new records of human individual and collective experience.

Impressing Velocity [Mt. Fuji] was developed by Fujihata from 1992 to 1994 and started the *Field-Works*' series. The project impresses the climbing velocity of the Mount Fuji into a three dimensional representation of the volcano. Grassmuck (1999) describes that in 1992, Fujihata and a group of friends climbed Mt. Fuji carrying a GPS and a laptop computer to acquire the primary data relating to the climbing velocity variations. On a second stage of the project, the data was mapped into a 3D dataset

of the volcano and distorted to represent the pace of the movement of the climbers, and the slower the movement of the group, the more extreme the overdrawing.

The work was first shown in 1994 at the *ICC Gallery,* in Tokyo, constituting various representations such as a topographical layer model made of laminated wood, a computer graphic, and a video database. Fujihata (1997) states that speed gives us a distorted view of the world, and that the project constitutes an unusual experience of perception. He adds that in a situation of high speed the viewer distorted view is revised by the brain that programs a final perception as a corrected normal view. The project aim is then to overcome that revision made by our brain and display the uncorrected distorted view of velocity in a visualization of the impression of speed. Different images can thus be generated using for example ascending or descending data.

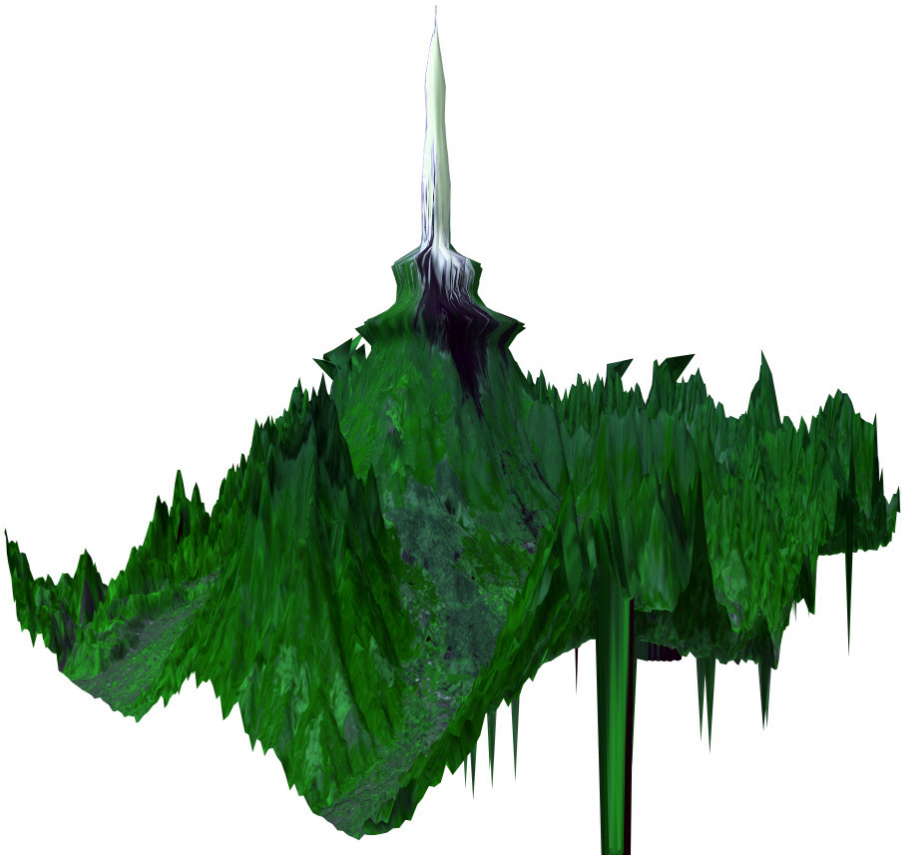

Fig. 83: Impressing Velocity [Mt. Fuji] (Fujihata 1992-1994).

Fujihata (Shaw & Weibel 2002:422) states that the project represents a schematic conversion of the extent of fatigue into pictorial form, and that the software created to document the overall project allowed viewing both ascending and descending video footage, together with the corresponding 3D GPS data, which made this documentation the starting point of the *Field-Works* series. Posterior developments of the project include a realtime version proposal from 1997 in which an algorithm generates distorted video images in realtime according to data grabbed by an accelerometer mounted in a remote controlled miniature car. The video images are projected to a screen in front of the viewer who is controlling the vehicle.
In 1999, *Impressing Velocity with Simulation Platform* was another part of the project produced for the exhibition *Net Condition,* at the *ZKM.* In the presentation text the author states that he used a hexaxial 3-D motion simulator combined with a camera and accelerator gauge mounted on a model train to try to portray the physical sensation of speed as expressed in the classical painting technique by means of image distortion (Shaw & Weibel 2003:422).

Newsmap, by Marcos Weskamp with Dan Albritton, 2004, is described in its project webpage as an application that visually reflects the constantly changing landscape of the *Google News* aggregator (Weskamp & Albritton 2004). The system scans *Google*'s news sites and creates a real time composition based on the headlines of the all communication media in the world. The result is a collage of rectangles symbolizing relationships between the news items and its relative worldwide coverage. There is also the use of a treemap visualization algorithm to display the information gathered by the aggregator that takes advantage of the space-constrained characteristic of the treemap visualization to reveal the underlying patterns in the news reporting across cultures and within news segments in a constant change across the globe.

It is also stated that *Newsmap*'s objective is to simply demonstrate visually the relationships between data and the unseen patterns in news media. Therefore it attempts to provide a new visual paradigm to organize, simplify, and analyze large amounts of data in order to overcome the highly disorganized collage of information that the Internet presents and the sensory information overload that we have to deal with on a daily basis.

Fig. 84: Newsmap (Weskamp & Albritton 2004).

Steven Blyth (2005:10) refers to Weskamp's *Newsmap* as an elegant example of visualizing information through a treemap, stating that *Treemaps*, previously referred in the study's concerning Martin Wattenberg's *Map of the Market,* 1998, were pioneered by Ben Schneiderman, and created out of the need to visualize information within a constrained space. In this context 'treemap' described the notion of turning a tree into a planar space-filling map in which the screen is split into rectangles.

Allen (2010) referrs the role of the Internet as a distribution channel for visualizations, as a place for the assembling of a diverse community of designers, programmers, cartographers, tinkerers and data wonks and as the best way to disseminate new ideas and tools for working with data in both visual and non-visual forms. He lists Weskamp's *Newsmap* in a sample of his favorite visualization projects on the Web and says that this project as the most beautiful interactive treemap on the Internet.

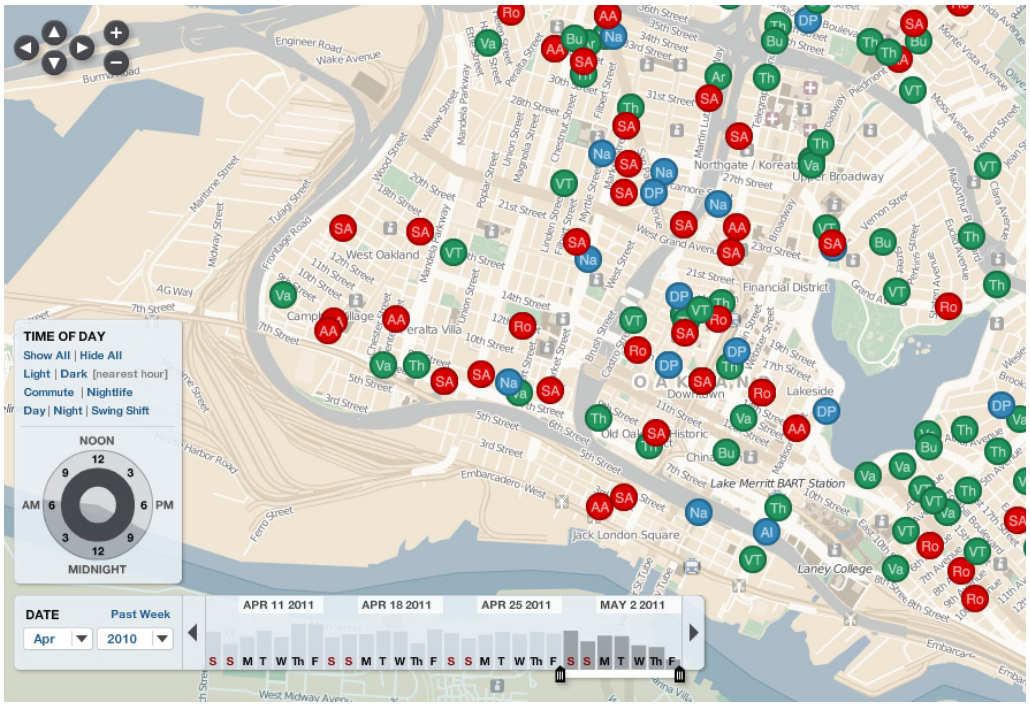

Fig. 85: Oakland Crimespotting (Stamen 2007).

Oakland Crimespotting, by Stamen's Michal Migurski, Tom Carden and Eric Rodenbeck, 2007, is now part of a general Crimespotting project that also includes a version mapping of the crime in San Francisco, named *San Francisco Crimespotting.* The project is described in its website as an interactive map of crimes in Oakland and a tool for understanding urban crime based on the citizen's rights to information and the notion that a clear understanding of their environment is essential to an informed citizenry (Migurski, Carden & Rodenbeck 2007).

Believing that the Web opens up opportunities to find information uncovered by the printed press or the news media, Stamen state that the purpose of *Crimespotting* was to show an overview of crime in Oakland over time and location, addressing an array of issues ranging from complex questions related to patterns and trends, to most local concerns on a block-by-block basis. In their opinion, *Crimespotting* enables us to do more than search for the things we already know, by addressing our need to explore public information, to draw connections, and to see new possibilities for questioning.

Stamen express their belief in the open exposure of civic data to the public, and through their project they seek to inspire the local authorities to use their data visualization model to operate the public release of other kind of data such as tree plantings, new schools, and any other information relevant to public communities and their neighborhoods. Stamen's statement ends by inviting the public to use the data in *Crimespotting* to become better informed about what's happening in their communities and to draw new conclusions on their own.

Greenfield (Greenfield & Shepard 2007) discussing his notion of "urban computing's" transition to "ambient informatics" refers to Stamen's *Oakland Crimespotting* stating that its importance is that when it plots the actuality of street crime on a map and makes that knowledge available, is making transparent something that shapes the affective experience of being in the city. It adds that this kind of information 'cries' out for a direct mapping back to the locations in question and out of the somewhat limited impact of its constriction to a computer or smart-phone screen. Greenfield asks how much powerful and actionable will things like *Crimespotting* be when they become ambient, when the information about a place 'comes to you' on location, and when you are actually walking through the streets of Oakland.

Migurski (2009:167) states that beautiful data is interesting, useful, public, free, and most important available for inspection and debate. The author, describing what he thinks to seem a typical project arc that starts with noodling and often ends as a full-fledged informational project, illustrates that *Crimespotting,* as happens with many projects, did not start with a concrete end goal in mind, but was born out of frustration, matured through basic technical research, and made public after a traumatic crime in Oakland that focused national attention on the city.

Migurski further (2009:168) describes the story of the project as having three parts. A first moment is when the data is extracted from the *Oakland Police Department's* Website home into a format more compliant to the slicing and mixing processes, a second moment when it is made available to the public to be used by local citizens in a dynamic website, and a last one, when a survey of how the project behaves, revisiting initial assumptions and responding to public feedback.

Fig. 86: DataCloud (Archined, Stealth and V2_Lab 1998).

DataCloud (1998-2004) is a Dutch project that also deals with urban data and its accessibility to the general public. *DataCloud* was developed in a joint effort from a concept created by Piet Vollaard, from *Archined,* Marc Neelen, Ana Dzokic, and Maartje Dros, from *Stealth* who also worked on the content, and in a dialogue with BikvanderPol and Milica Topalović; Anne Nigten, Brigit Lichtenegger, Lenno Verhoog, Maarten Handstede, Enric Gili Fort, Erik Kemperman, and Lobke Hulzink, from *V2,* who were also responsible for the application development (Archined, Stealth & V2_Lab 1998).

Stealth's project website describes *DataCloud* as a relational info-space that originated from the desire to make complex sets of urban data accessible in a spatial and visual way. *DataCloud,* who involved the concept and programming of its software application as well as the creation of its unique content, was developed over a timeline that spans from 1998 to 2004 outputting three individual instances over that period.

Stealth states that a first instance of the project was named *DataCloud 1.0,* also known as *DWHW, Datawolk Hoeksche Waard,* and was set up to work as a community tool to collect, discuss and browse both factual—figures and images, and more fuzzy data—stories and sounds, about *Hoeksche Waard*—an area close to Rotterdam. The project was awarded with the *Dutch National Millennium Prize* for investigations in Arts and Science in 2002, and the prize money was used to develop the *DataCloud 2.0* instance.

In regard to *DataCloud 2.0,* it states that the content media-objects are represented as spatial elements within a 3D navigable environment, and acts as an archive of observation and as abstractions of the research on uncontrolled urban processes happening in the city of Belgrade.

About the last instance, a demonstration prototype named *DataCloud 2.5/2.7,* it states that it focuses on advancements in the functionality and knowledge processing of the application, along with the testing of user interaction. The *2.5* version deals with the shifting urban domain if the City of Rotterdam from a cinematographic point of view, while the *2.7* version was made to facilitate the presentation of a design project, *The Office of Alternative Urban Planning, TOOAUP,* by the students of the *Berlage Institute* at *Manifesta 5,* in San Sebastian.

The concept of the project is described as aiming at establishing new ways of reading and perceiving multi-layered sets of information in a framework that works as a knowledge map that combines the possibilities of various types of media and metadata within a computer-generated 3D environment. The *DataCloud* information space is navigable and able to be explored from different layers of information, which can be discovered and reorganized to suit the user particular interests and preferences. Users can also go beyond the search environment and reflect and comment upon the content, a characteristic that makes *DataCloud* a tool that is able to support a broad based social, strategic, and political dialogue, as the one needed in the investigation of complex issues such as urban development.

In 2002, *dLux* media arts' *Futurescreen02* in Sydney, Australia, presented *Data Terra,* described as a series of events investigating the mediation of data across tech-

nological, cultural, and physical terrains. *Data Terra* featured *Desert Rain,* a large scale interactive piece by *Blast Theory,* already referred in this study with *Can You See Me Now?*, a piece from 2001, and The *All Star Data Mappers,* an exhibition at the *Artspace* gallery curated by John Tonkin.

The *All Star Data Mappers* is described as an inter/national (sic) survey of artists and designers who are building Information visualization software in order to navigate the complex terrain of the electronic datasphere, and that the works presented a variety of possibilities, ranging from data analysis tools to works that explore the side effects of our increasingly inter-dependent relationship with our computers. It adds that *All Star Data Mappers* highlights artists and works that gather, process and redistribute (Tonkin 2002).

Some of the works or authors presented were already referred in the study's data in the context of other events and other projects. This is the case of Benjamin Fry's *Valence,* 1999-2002, Josh On and Futurefarmers' *They Rule,* 2001, and Mary Flanagan's *[Collection],* 2002, all referred as part of *The Whitney Biennial 2002 Net Art Selection,* curated by Christiane Paul. The exhibition features another piece from Fry, *Tendrill,* 2000, a web browser that takes the text content of web pages to construct typographic sculptures, and two pieces from Golan Levin (already referred in the study along *The Dumpster*, from 2006), *The Secret Lives of Numbers,* with Jonathan Feinberg, Shelly Wynecoop and Martin Wattenberg, which was an interactive data visualization commissioned by *Turbulence.* This project surveys the relative popularity of numbers, while *Axis* is a geo-socio-political data visualization that responded to a specific commission made by Christiane Paul for *The Whitney Museum's Artport website.*

From the *All Star Data Mappers* exhibition, the study's data refers the following three artifacts: *./logicaland,* 2002, *Firmament,* 2001-2003, and *Minitasking,* 2002.

./logicaland is a project developed by Maia Gusberti, Michael Ashauer, Nik Thönen, and Sepp Deinhofer, in 2002. Its website literature describes the project as a collective simulation game based on the data gathered by a global world model from the 1970s that was removed from its original context and adapted into a participative

online game. In the information section one reads that the project is a study for visualizing our world's complex economical, political, and social systems while engaging people into strategies of raising human sensibility and responsibility within the global networked society. As a participative global simulation application, controlled by a community of unlimited participants, the authors state that the challenge was to develop ideas, tools and visualizations that worked according to the complex requirements of complex correlating systems and with the world's complex participative environment (Gusberti et al. 2002).

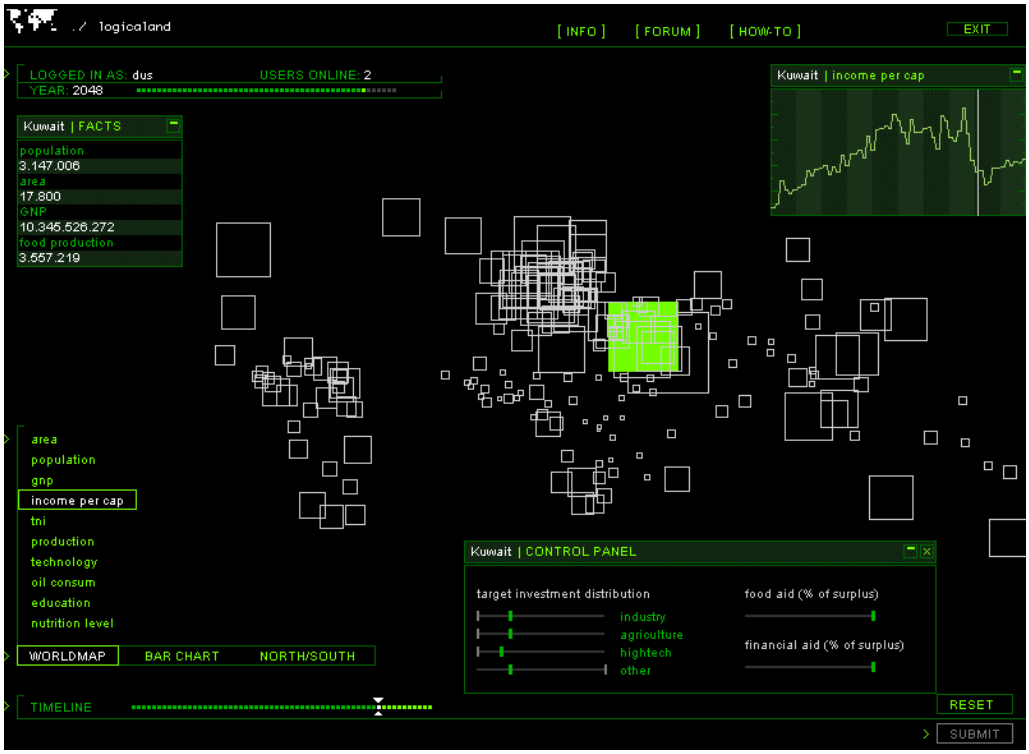

Fig. 87: ./logicaland (Gusberti et al. 2002).

It is referred that *./logicaland*'s main idea was to provide a web-based world-simulation within a participative environment that allowed its users to contribute with their influence to the system. The goal of the project was to enable its users to reach an understanding of how global interrelationships unfold and how serious change is effected only through a common effort in such specific system. The *./logicaland* software is free and its source code, available for download through their website, is released under the *GNU GPL License.*

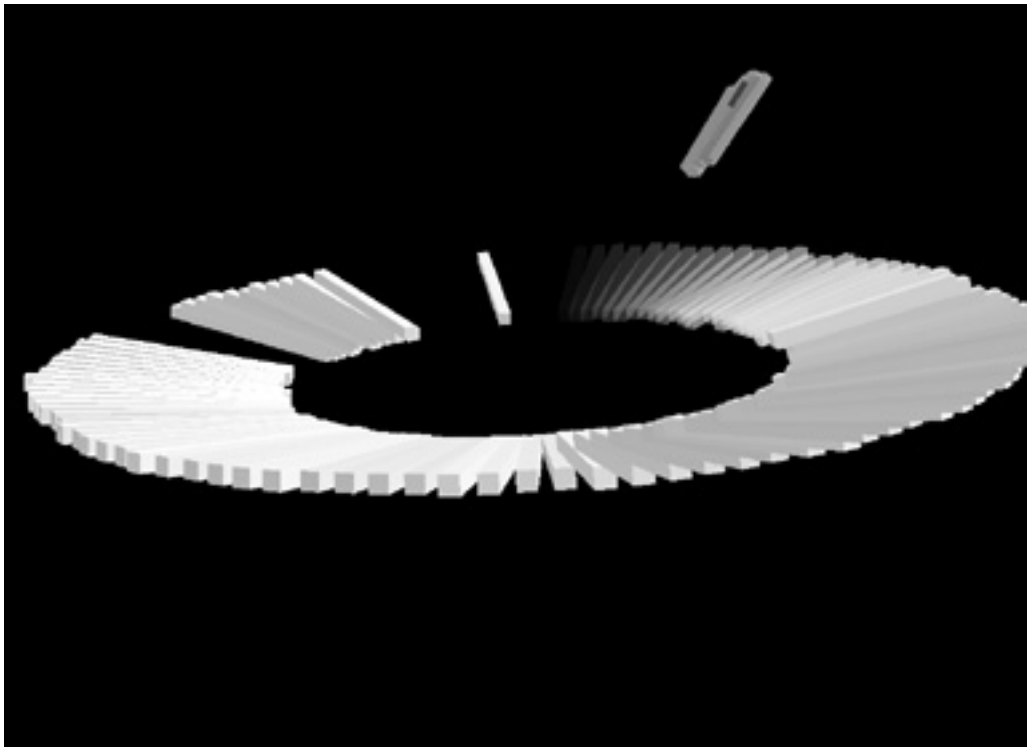

Fig. 88: *Firmament (Kaye & Mr Snow 2001).*

Firmament, by Zina Kaye and Mr Snow, 2001-2003, is a Java application / Pure Data patch built to interface and visualize the data coming from an old radio telescope antenna from the Soviet era, abandoned by the Russian Army in 1994, and repaired by the *Ventspils International Radio Astronomy Center.* The project, described as an audio visual representation of the data collected by a radio telescope, was developed during the *acoustic.space.lab* project at Irbene, Latvia, in 2001, in a symposium involving a team of 30 sound artists, net and community radio activists, and radio amateurs who, in co-operation with the VIRAC scientists, were exploring the possibilities of the d=32 meters dish antenna (Kaye & Mr Snow 2001).

The *acoustic.space.re-lab* (2001) website highlights the event as a great chance for artists to access and work with such a specific "old and heavy" technology that due to its secret past and remote location was never before explored for civilian purposes. It also notes how the project succeeded to facilitate a new context for a collaborative exploration, experimentation, and data processing.

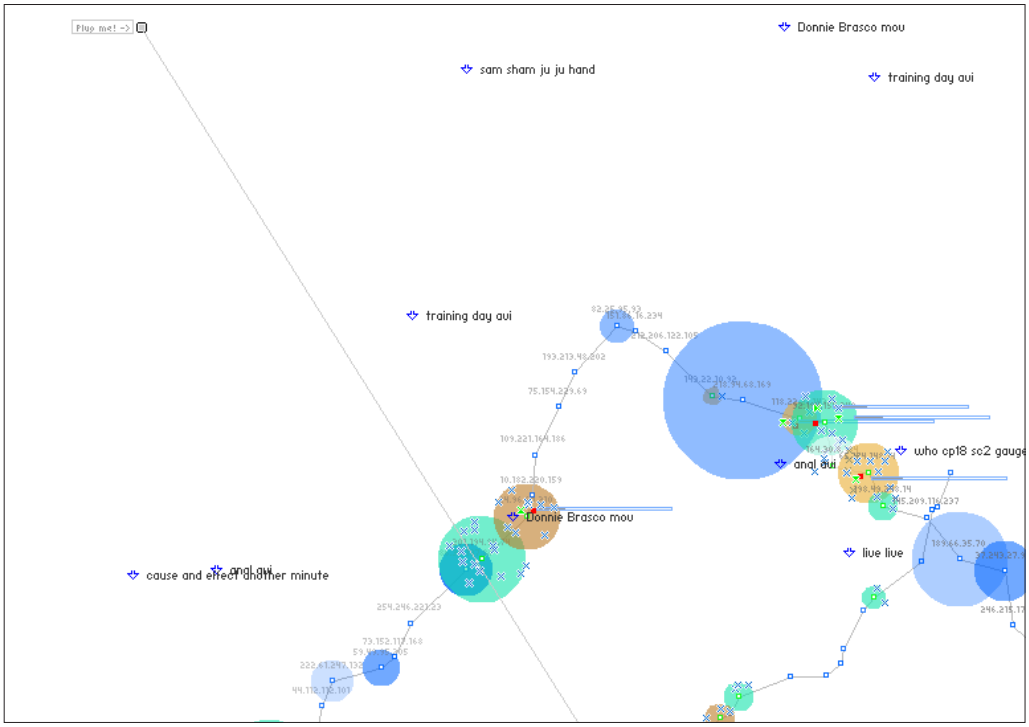

Fig. 89: Minitasking (Pascual & Hauer 2002).

Minitasking, by *Schoenerwissen* (Anne Pascual and Marcus Hauer), 2002, is described as a graphical browser that visualizes the *Gnutella* network, and provides a visual rendering of the properties of the dynamic temporarily created peer-to-peer networks that introduce a degree of transparency to the exchange of data and network's stability. *Minitasking*'s design process is signaled as an analysis tool of the *Gnutella* network, which is an example of a shared virtual space and a distributed system. The authors state that a discussion about the limits or potential of these systems refer to the flow and exchange of data, the rhythm of behavior, as well as the rules of a distributed network that the project investigates (Pascual & Hauer 2002a).

The *Minitasking* interface is described as connecting to the network and representing other *Gnutella* servents that encounters as bubbles whose size and color depends on the amount of content they host. Its user's queries are color-coded and matched by *Minitasking* as bubbles in others servents that match the original query color. The queries received by other users in the system are also visualized floating around the screen. *Minitasking* got an *Award of Distinction* in the *Net Excellence Category*

in 2002 *Ars Electronica Festival.* The Jury (Pascual & Hauer 2002b) stated that *Minitasking* displays the data it gathers from people's computers as beautiful visual elements that move and constantly provide visual feedback, that the project brings out the voyeuristic tendencies in anyone that watches the search strings appear, and that it is a brilliant use of common technology on the Internet that works almost as a view into people's minds.

The study's data description concludes with a reference to two more artifacts with a strong political emphasis, Christoph Watcher and Mathias Judd's *Zone*Interdite,* from 2006, and *George W. Bush, Harken Energy, and Jackson Stephens, ca. 1979-90 (5th version),* from 1999, one of Mark Lombardi's monumental drawings depicting George W. Bush's *Harken Energy* business venture, long before he was the governor of Texas, and much less the President of the United States.

Fig. 90: Zone*Interdite (Watcher & Judd 2006).

In *Zone*Interdite,* the authors state as their artistic ambition the will to gain their view of the world freed from the blackouts masking their perception that military restricted areas constitute. In the project, people send information about forbid-

den access places, and some of those areas are reconstructed as artificial 3D virtual worlds (Watcher & Judd 2006).

The *Zone*Interdite* Internet project is described as a test arrangement that works as a point of departure for individual exploratory tours and as a collection point for users' own findings. It constitutes a combination of a search engine and an atlas, which results in a global military overview that overrides nation states and power blocks. A PC-version is available for download at the project's website to be personally explored as a virtual walkthrough featuring the *Guantanamo Bay* with its prison camps and an Islamic training camp in Sudan (Watcher & Judd 2006).

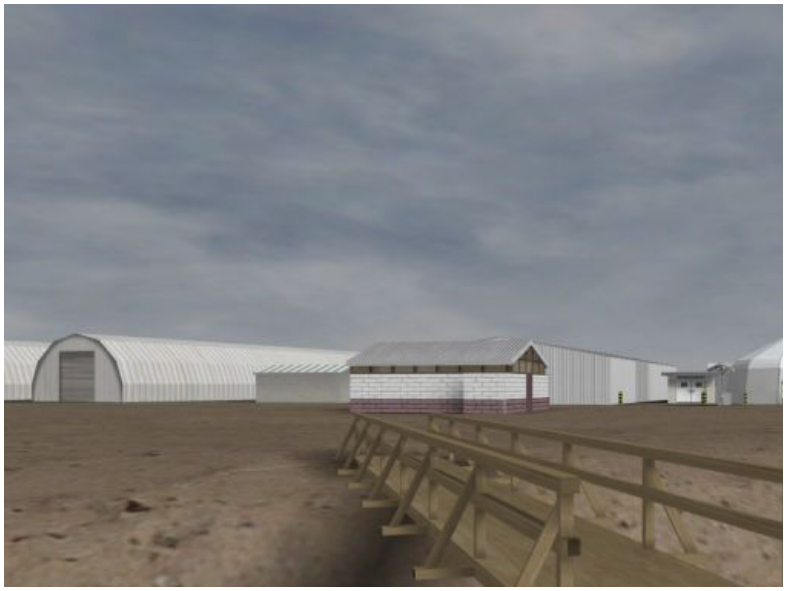

Fig. 91: Zone*Interdite (Watcher & Judd 2006).

It is stated that the power of the project lies in the disarming and lapidary view of a world of military power, in which individual imagination and the joy of discovering contribute to the undermining of censorship and the restriction of perception, and allow its users to gain the possibility to realize what freedom and self-determination could be. The authors state that the project emerged from the paradox that while it is forbidden to depict or enter military areas, these pictures still appear in the mass media as armed forces' propaganda and as a demonstration of power. The project collects, localizes, and maps those blind spots in an attempt to allow us to take ownership of our own terrain and experience the world more completely. Valentina Cu-

latti (2006) states that the project's power lies in disarming the military force of its censorious power and lighting up those shadow zones that the public is deprived of.

Wachter and Judd on-going collaboration since 2000, is described in their *Transmediale 09* profile as investigating issues such as which forces affect our subjective perspective?, and up to what point are we the authors of a particular view?; when apparently our individual processes of perception are revealed as a collective phenomena.

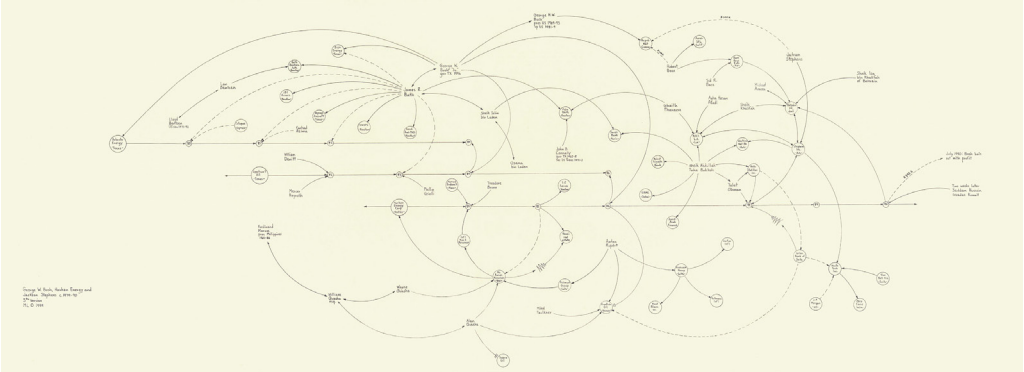

Fig. 92: George W. Bush… (Lombardi 1999).

Mark Lombardi's (1951-2000) striking work came to the study's attention through the talk *Learning from Lombardi,* by Benjamin Fry, at Alice Rawsthorne's panel for *Experimenta Design 2009,* in Lisbon, Portugal. Fry's choice to the talk was framed by the panel's conceptual approach were the presenters were asked to choose an individual, movement, or technology, whose importance had been overlooked, to be contextualized with a couple of themes thought to be central to the future development of architecture and design. Fry states that his choice of Lombardi and his work illustrates the importance that working with data has to the future of design.

According to Fry (2009), Lombardi, being an avid reader and consumer of information, began to create large drawings in 1994 to depict the complex narratives about his research interests that would range from failed banks to corruption in organized crime. Initially the drawings were not intended to became artworks, just playing the role as exploratory steps to clarify Lombardi's reasoning about those stories, but Fry states that in the years to follow, Lombardi's images became sophisticated networks that told exceptionally detailed stories by themselves.

The *George W. Bush, Harken Energy, and Jackson Stephens, ca. 1979-90* piece is described in Fry's talk as a drawing that depicts a story about former President George W. Bush, before he was governor of Texas. It states that he received $4.7 million dollars from about fifty different family members to start an energy company, *Arbusto Energy,* later *Spectrum 7 Oil,* and *Harken Energy Corp.,* and that despite of the company poor performance, posting enormous losses, it was later sold to people with connections with the Bush family, with George W. receiving millions of dollars in stock in spite of the obvious failure of the venture. Lombardi's 4 feet wide and 2 feet tall piece lays down the complexity of the story's connections, making accessible a story hard to tell and even harder to understand by sheer words.

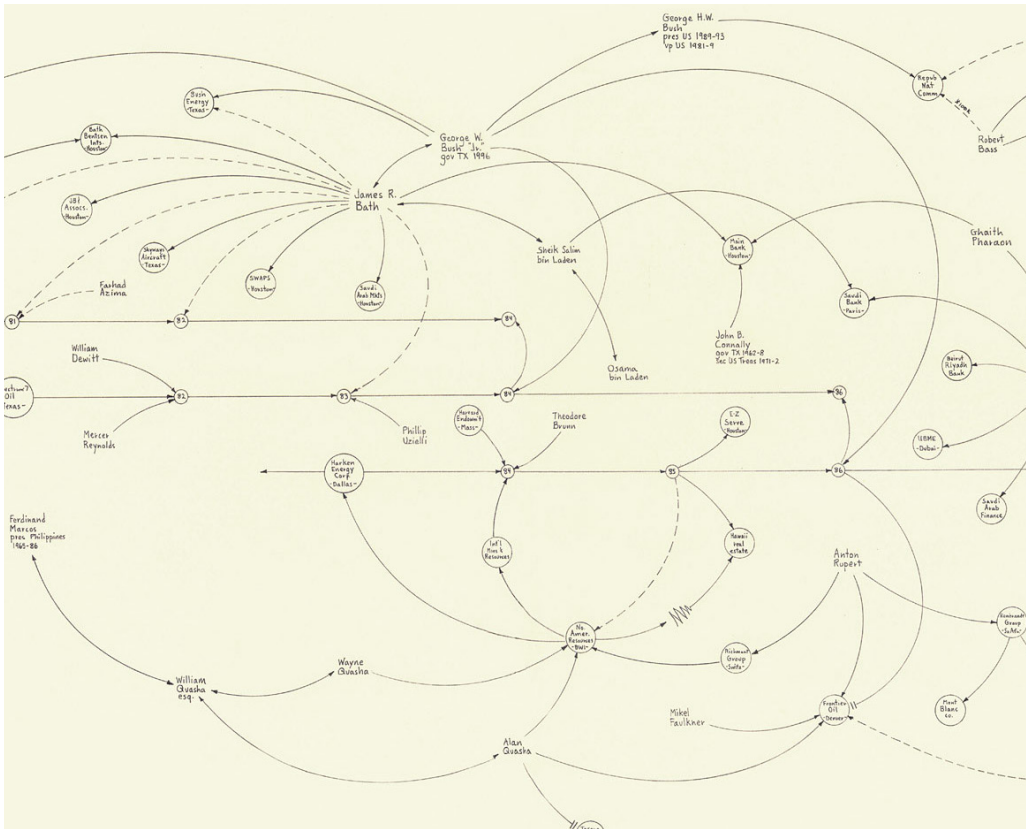

Fig. 93: Geoge W. Bush… detail (Lombardi 1999).

Robert Hobbs (2003:99) states that Lombardi's piece explores how the roles of cronyism and inside trading played in the fortunes of George W. Bush in the 1980s, and that the events charted by Lombardi in the piece are a delineation of Bush's activi-

ties articulated in three horizontal timelines that (from top to bottom) correspond to *Arbusto Energy, Spectrum 7 Oil,* and *Harken Energy.* The mapping concludes with the year 1990 and the figure "$848 K", together with the notation "July 1990 Bush bails out w/ profit. Two weeks later Saddam Hussein invades Kuwait" (Hobbs 2003:100).

Hobbs (2003:12) places Lombardi's work in the tradition of the eighteenth and nineteenth Centuries history painting picked up in the 1960s by Conceptual artists wanting art to represent important historical and political acts. It exemplifies citing Hans Haacke's role of investigative reporter in his piece from 1971, *Shapolsky et al. Manhattan Real Estate Holdings, a Real-Time Social System, as of May 1, 1971,* that consists of 142 photographs of New York apartment buildings, two maps of New York's Lower East Side and Harlem (with properties marked), and six charts outlining the business relationships from 1951 to 1971 of this real-estate group of slum landlords shady dealings, and the 1973's Gordon Matta-Clark *Realty Position-Fake Estates: Block 3398, Lot 116.*

Comparing Lombradi's work to Haacke and Matta-Clark's vision of art as a logical repository for substantiated data, Hobbs (2003:13) states that the series of drawings that Lombardi coins as *Narrative Structures* developed since 1994, are both more conservative and more advanced than theirs, as Lombardi intended to update history painting in terms of theories of globalism and rhizomatic schematizations of power that are characterized by the less centralized and the more serendipitous channels of power models.

Hobbs (2003:14-15) states that Lombardi's option for a structuralist paradigm where information is dramatized in terms of sets of imbricated networks, so that individual players are defined by the overall governing structures in which their names appear and without distinct origins or beginnings, is consistent with Michel Foucault's theory of Genealogy as a series of accidents, oppositions, and dispersals rather than unified beginnings, and with Deleuze and Guattari's concept of Rhizomes as models for human interactions.

Procedures

Data Collection

The data in this study was retrieved from two interrelated sources: a selection of 100 individual artifacts in database-related practices extracted from a larger global database of 216 artifacts, which were identified as being database-related, and the associated literature to the artifacts, to their individual and or collective contexts, and to the identified field as a whole.

Acknowledging the worldwide dispersion of sources and information, and the 'transformative technology' (Lee 2000:115) of most interest in overcoming this dispersion that the Internet constitutes was the main reason to opt for the World Wide Web as the main field of research and data collection source. As stated in the data section, the study made use of our personal knowledge, the knowledge from others identified as authoritative sources, and procedures similar to snowball sampling (Lee 2000:14) that enabled the identification of similar data from similar contexts (Trochim 2006) and conducted the process of data identification and collection.

Lee (2000:115) points out that the advent of the Internet not only changed the way societies convey information about themselves, but also accomplished more information through technical means whose characteristics such as playfulness, opportunity and serendipity make the online context a natural field for the research practice. He adds (2000:118), by quoting a remark by Webb et al., that 'Archives are where you find them' (1981:139), meaning that the archives are increasingly found on the Internet and readily accessible and retrievable from thousands of miles way, overcoming constraints of time, cost and distance (2000:137).

One should note that it was precisely the rise of the computerized society and its interconnectivity by global networks, such as the *Internet* and the *World Wide Web,* that promoted the widespread access to the vastness of organized information, and that took the term database, only coined in the nineteen-seventies, to the mainstream and to the fore in the popular imagination (Cook, Dietz & Kiendl 2004). Moreover, it is the computer that interfaces and mediates the digital dynamic datas-

paces, which are both the subject and material of the study's data units. Their choice and the choice of the associated networks remain the principal source of the study's data collection, which is then a natural one.

The study's total collected data is thus constituted by a collection of 100 individual artifacts, and all the associated literature: the projects' descriptions, project and artists' statements, festivals, exhibitions and exhibition curators' statements, artists and theorists' articles, papers and books that explicitly address the identified field and or other authors, or other works in the identified field, or that contributed to the definition and or identification of a field of similar work, with similar subjects and working with similar materials and similar approaches. The process of collecting both types of data happened simultaneously, each type of data contributing to the further identification and collection of associated data in similar contexts.

In the process of establishing the unit of analysis, the study privileged the collection of artifacts that were aggregated in the context of exhibitions. These were explicitly defined as exploring the database, data or information as their main subject. Following that decision, the study could take advantage of the associated literature, such as texts and theory regarding those events, their sub-themes, and the included works. Similar artifacts from previously identified authors were also included in the sampling, as well as artifacts referred by multiple sources, while others were motivated by our personal knowledge, and as such underline the judgmental nature of the sample and its usefulness and appropriateness to the exploratory nature of the study (Foss & Waters 2007:143).

Sample Units List

1. Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 Through August 8, 1971, Hans Haacke, 1971 @ Database Imaginary
2. Worldprocessor, Ingo Günther, 1989 @ From Wunderkammer to Meta-Data
3. The Giver of Names, David Rokeby, 1990 @ Database Imaginary
4. Impressing Velocity, Masaki Fujihata, 1992-1994 @ Making Art of Databases
5. The File Room, Antoni Muntadas, 1994-2010 @ Database Imaginary

6. Exactitudes, Ari Versluis, Ellie Uyttenbroek, 1994-2004 @ From Wunderkammer to Meta-Data
7. Dangling String / Live Wire, Natalie Jeremijenko, 1995
8. Slippery Traces, George Legrady, 1995 @ Database Imaginary
9. Databank of the Everyday, Natalie Bookchin, 1996 @ Database Imaginary
10. Conversation Map, Warren Sack, 1997-2000 @ Frieling
11. Map of the Market, Martin Wattenberg, 1998 @ Wilson @ Paul
12. (Two Line) Orbital Elements, Dietmar Offenhuber, 1998 @ Ars Electronica 98 Infowar
13. Solar, Marko Peljham, 1998 @ Ars Electronica 98 Infowar
14. Datacloud, Archined, Stealth, V2_lab, 1998-2002 @ Making Art of Databases
15. Zgodlocator, Herwig Weiser, 1998-2002 @ From Wunderkammer to Meta-Data
16. I/O/D 4: The Web Stalker, I/O/D's Mathew Fuller, Colin Green, Simon Pope, 1998 @ Frieling @ Paul
17. DissemiNET, Sawad Brooks, Beth Stryker, 1998 @ Data Dynamics
18. George W. Bush, Harken Energy, and Jackson Stephens, Ca. 1979-90 (5th Version), Mark Lombardi, 1999 @ Fry
19. netomat™, Maciej Wisniewski, 1999 @ Data Dynamics
20. Things Spoken, Agnes Hegedus, 1999 @ Database Imaginary
21. Riot, Mark Napier, 1999 @ Whitney 2002 Net Art Selection
22. 1:1, Lisa Jevbratt, C5, 1999-2002 @ Database Imaginary @ Whitney 2002 Net Art Selection
23. Valence, Ben Fry, 1999-2002 @ Whitney 2002 Net Art Selection
22. ecosystm, John Klima, 2000 @ Wilson @ Paul
25. Encyclopaedia, Alan Curral, 2000 @ Database Imaginary
26. Eternal Summer, George Legrady, 2000 @ Wilson
27. The Top Grossing Film of All Time, 1x1, Jason Salavon, 2000 @ Whitelaw
28. Synthia, Lynn Hershman, 2000-2002 @ From Wunderkammer to Meta-Data
29. They Rule, Josh On and Futurefarmers, 2001 @ Whitney 2002 Net Art Selection @ From Wunderkammer to Meta-Data
30. Earth, John Klima, 2001 @ Whitney 2002 Net Art Selection
31. Camouflage Town, Adrianne Wortzel, 2001 @ Data Dynamics
32. Artport Idea Line, Martin Wattenberg, 2001 @ Whitney Artport @ Paul
33. Point-to-Point, Mark Napier, 2001 @ Data Dynamics

34. Everything, All at Once, Jason Salavon, 2001
35. Pocket Full of Memories, George Legrady, 2001, 2003-2007 @ From Wunderkammer to Meta-Data
36. Carnivore, Alex Galloway + RSG, 2001 @ Frieling
37. Turns, Margot Lovejoy, 2001 @ Whitney 2002 Net Art Selection
38. Firmament, Zina Kaye, Mr Snow, 2001-2003 @ All Star Data Mappers
39. Can You See Me Now? Blast Theory, Mixed Reality Lab, Equator Interdisciplinary Research, 2001 @ From Wunderkammer to Meta-Data
40. Poetry Machine_1.5, David Link, 2001 @ From Wunderkammer to Meta-Data
41. The Analogous Landscape: Rim Of Fire, C5, 2001 @ C5
42. Globe-jungle Project, Yasuhiro Suzuki, 2001 @ From Wunderkammer to Meta-Data
43. Minitasking, Schoenerwissen (Anne Pascual, Marcus Hauer), 2002 @ All Star Data Mappers
44. ./logicaland, Maia Gusberti, Michael Aschauer, Nik Thönen, Sepp Deinhofer, 2002 @ All Star Data Mappers
45. Listening Post, Mark Hansen, Ben Rubin, 2002-2005 @ Decode
46. Out of the Ordinary (Carnivore Client), Lisa Jevbratt, 2002 @ Carnivore
47. [Collection], Mary Flanagan, 2002 @ Whitney 2002 Net Art Selection
48. Tap, James Buckhouse, Holly Brubach, 2002 @ Whitney 2002 Net Art Selection
49. Agent Ruby.com, Lynn Hershman, 2002 @ From Wunderkammer to Meta-Data
50. 100.000 Streets, Geert Mul, 2002 @ From Wunderkammer to Meta-Data
51. Web of Life, Jeffrey Shaw, Michael Gleich, Bernd Lintermann, Andreas Kratky, 2002 @ From Wunderkammer to Meta-Data
52. Soft Cinema, Lev Manovich, Andreas Kratky, 2002 @ Database Imaginary @ From Wunderkammer to Meta-Data
53. CodeZebra, Sara Diamond and CodeZebra inc. 2002 @ From Wunderkammer to Meta-Data
54. Data Mining the Amazon, Angie Waller, 2002 @ Database Imaginary
55. How I Learned (1-4), Jennifer Mccoy and Kevin Mccoy, 2002 @ Database Imaginary

56. Swipe, Beatriz Da Costa, Jamie Schulte, Brooke Singer, 2002 @ Database Imaginary
57. Template Cinema: Short Films About Flying, Jon Thomson, Alison Craighead, 2002 @ Database Imaginary
58. Treatycard Version 2 (Tcv2), Cheryl L'hirondelle Waynohtêw, 2002-2004 @ Database Imaginary
59. Unmovie, Philip Pocock, Onesandzeros, Gregor Stehle, Axel Heide, 2002 @ Database Imaginary
60. Field-work@Alsace, Masaki Fujihata, 2002 @ Making Art of Databases @ Future Cinema
61. Infome Imager Lite, Lisa Jevbratt, 2002-2005 @ Whitelaw
62. Migration, Lisa Jevbratt, 2002-2005 @ Wilson @ Liu
63. PoliceState (Carnivore Client), Jonah Brucker-Cohen, RSG, 2003 @ Carnivore @ From Wunderkammer to Meta-Data
64. The Perfect View, C5, 2003 @ C5
65. Data Diaries, Cory Arcangel, 2003 @ Database Imaginary
66. Nine(9), Graham Harwood (Mongrel), 2003 @ Frieling @ Dietz
67. Newsmap, Marcos Weskamp, Dan Albritton, 2004 @ Wilson
68. Apartment, Martin Wattenberg, Marek Walczak, 2000-2004 @ Data Dynamics
69. Memory Theater, Pablo Helguera, 2004 @ Database Imaginary
70. Soft Rains, Jennifer and Kevin Mccoy, 2004
71. The Other Path, C5, 2004 @ C5
72. Agonistics: A Language Game, Warren Sack, 2004 @ Database Imaginary
73. Faculty of Taxonomy, University of Openess, 2004 @ Database Imaginary
74. Lungs-london.pl, Graham Harwood, Mongrel, 2004 @ Database Imaginary
75. Mobile Scout: A Field Guide, Julian Bleecker, Scott Paterson, Marina Zurkow, 2004 @ Database Imaginary
76. Shelf Life / Drawing Conclusions, Edward Poitras, 2004 @ Database Imaginary
77. The Status Project, Heath Bunting, Kayle Brandon, 2004 @ Database Imaginary
78. The C5 GPS Media Player, C5, 2005 @ C5
79. Lungs: Slave Labour, Graham Harwood, 2005 @ Wright
80. Spam Architecture, Alex Dragulescu, 2005 @ Whitelaw

81. Everything, All at Once (Part III), Jason Salavon, 2005 @ Whitelaw
82. Making Visible the Invisible, George Legrady, 2005-2014 @ Wilson
83. Zapped! Preemptive Media, 2005 @ Database Imaginary
84. Flight Patterns, Aaron Koblin, 2006 @ Decode
85. Zone*Interdite, Christoph Watcher, Mathias Judd, 2006 @ Wilson
86. Spam Plants, Alex Dragulescu, 2006 @ Whitelaw
87. The Voice, Lisa Jevbratt, 2006-2009
88. The Dumpster, Golan Levin, Kamal Nigam, Jonathan Feinberg, 2006 @ Whitney Artport
89. Cell Tango, George Legrady, 2007 @ Wilson
90. Oakland Crimespotting, Stamen, 2007 @ Beautiful Data
91. State of the Union, Brad Borevitz, 2007 @ Whitelaw
92. Statistical Clock, Fiona Raby & Anthony Dune, Michael Anastassiades, 2007-2008 @ Fallman
93. Dataflow, George Legrady, 2008 @ Wilson
94. Hello, Weather! Andrea Polli, 2008 @ Whitelaw
95. The Idea of a Tree, Mischer'Traxler, Katarina Mischer, Thomas Traxler, 2008 @ Whitelaw
96. All Streets, Ben Fry, 2008
97. Perpetual Storytelling Apparatus, Julius von Bismarck, Benjamin Maus, 2009
98. Portrait (Rembrandt), Jason Salavon, 2009
99. The Weather Bracelet, Mitchell Whitelaw, 2009
100. Social Collider, Karsten Schmidt, Sascha Pohflepp, 2009 @ Decode

Data Analysis

As stated, this study's data was collected from 100 individual artifacts, their related literature—both specific and contextual—and the study's own theoretical literature. Data collection and analysis, or at least a form of preliminary analysis, conflated in a process in which the theoretical literature's place in the project was regarded as emergent and treated as data (Dick 2005). The data collection took place through reading the retrieved documents—texts, images, videos—that constitute the documentation of the artifacts, and when possible through the experience of the actual artifacts, by actually using them, for instance when their output was web-

based as is the case for example with the artifacts integrated in *The Whitney 2002 Net Art Selection*.

The methods or measures used can be characterized as Unobtrusive and/or Non-reactive (Webb et al. 1966, 1981 qtd in Lee 2000), as they did not disturbed the social environment by direct questioning, interviewing or surveying its subjects, and refer to data gathered by means that do not involve direct elicitation of information from research subjects (Lee 2000).

Although one of the main reasons for the 'non-reactive' nature of unobtrusive measures as proposed by Webb et al. (1981 qtd in Lee) is to address the possible problems created by the presence and interference of the researcher in the subject's environment (Lee 2000), the choice for a non-reactive approach in this project relates both to the nature of the project—exploratory, panoramic and descriptive—and the type of data that was collected; diverse, heterogeneous, and sparse—both in time and in place. For practical reasons and feasibility, the study opted to devote its attention to the use of documentary sources, and worked with data retrieved from the Web, regarded as a research site (Lee 2000) whose archival characteristics are inherent in its operating technologies, combined with common documentary sources in other mechanical archival containers such as books and printed articles. As Kellehear (1993) points out, although Sociology (and Social Sciences in which unobtrusive research developed) tends to favor reactive measures as the style of empirical investigation, three of its most well-known figures from the early beginnings such as Durkheim, Weber and Marx, spent most of their time in libraries developing archival work.

The researcher's relationship to the field of study, albeit through unobtrusive non-reactive measures, and as such constituting in a different kind of immersion, still characterizes itself through the most important traits and rationale of the qualitative research methodological tradition and design. The study's topics need to be explored, the research question's nature points to a qualitative study, and the researcher is unmistakably the instrument of data collection (Dartney-Mensah 2000).

Concerning the data analysis procedures, this study makes use of a straightforward approach for qualitative data analysis designated *General Inductive Approach,* which

was created by David R. Thomas (2003) and is described as producing outcomes similar to those derived from Grounded Theory (Glaser & Strauss 1967). The characteristics of that theory also informed this study, namely its process focus on theory generation, the emphasis on discovery and creation, the focus on the process rather than the product, its grounding in data, and the prominence of data of a qualitative nature as a prime indicator of a particular proposition in the study's framework (Foss & Waters 2007:148-149).

Thomas points out the common purposes for using an inductive approach in the context of qualitative data analysis—the need to condense an extensive raw text data into a brief summary format, the establishing of clear links between the research objectives and the summary findings derived from the raw data, and the development of a model or theory about the processes that are evident in the raw data—and asserts an outline for a brief, non-technical and straightforward set of systematic procedures for analyzing qualitative data, where the analysis is guided by specific objectives, without the restrains imposed by other structured methodologies.

Thomas (2003:3) argues that the inductive approach is evident in several types of qualitative data analyses, whether explicitly labeled inductive or not, but especially in Strauss & Corbin (1990 qtd in Thomas 2003) branch of grounded theory, and similar to the general pattern of qualitative data analysis described by others, such as Miles & Huberman (1994:9 qtd in Thomas) and Pope et al. (2000 qtd in Thomas 2003). The assumptions that Thomas describes as underlying the use of an inductive approach to the data analysis are in accordance with the present study, namely a deductive/inductive dynamic characterized by the data analysis determination by both the research objectives and the multiple readings and interpretations of raw data, the primary mode of analysis concerning the development of categories from raw data into a framework that captures the key strategies judged to be important for the study, and the findings' shaping being characterized by the assumptions and experience of the researcher that conducts this research and carries out the data analysis.

The study's data coding took place through the lens of the pre-established conjunction of categories defining exploration, whether arising from the theoretical literature data, such as Fallman's model for design exploration, or explorative design

(2011) and Stalbaum's exploratory Data Formalism (2004a), or from the raw data itself—the 100 artifacts contributing to the study's general data. The resulting core categories contributing to the model disclose the key features described by Thomas (2003:4), namely the category label, its description, key characteristics, scope and limitations, the illustrative data associated with the category, its meanings associations and perspectives, the potential linkings with other categories, and finally an open model network in which to embed the category system.

The choice for the general inductive approach for the qualitative analysis of the data in this study, is focused on its stated similarity to the grounded theory approach, as Thomas states (2003:9) that it may produce analysis outcomes that are indistinguishable from the ones derived from grounded theory, but through a more straightforward, low-technical user-friendly set of procedures.

Significance

This study proposes an exploratory overview of database use and database exploration in artistic practices. The acknowledgement of the database as a new symbolic form of the computer age and as a new way to structure our experience of ourselves and of the world (Manovich 2002) turns this major language container of the 'mode of information' (Poster 1990) into a central resource and material for artists willing to explore this repository of the world's dynamics.

The recognition of the database as an ubiquitous cultural form that pervades every aspect of our contemporary environment and lived experience leads artists to imagine its possibilities in astounding and challenging ways in their work (Cook, Dietz & Kiendl 2004).
With this notion in mind, and bearing on the available literature, the study clearly identifies a large corpus of work constituting of 216 individual projects that are collected in the study's global database and from which a sample data of 100 projects was collected and its detailed description and exploratory analysis were made available.

This research offers a historical background of the significance of the database in human culture, its relation to previous forms of knowledge archival and retrieval, its overall relationship with the 'semiotization' and digital dematerialization of the world (Gere 2002), and its entanglement in the socio-economic and socio-political

dimensions of the human existence. The database ubiquity is particularly expanded in the context of computer powered and digitally encoded virtual dynamic dataspaces (Paul 2007) where scale, complexity, size and density move the database beyond human perception to a non-human scale (Manovich 2000).

The work reveals database exploration as an identifiable trend in artistic practices and contributes to the characterization of its exploratory qualities. In order to characterize and categorize exploration, the study articulates its data analysis through a set of concepts that focus on aspects relating to exploration through design research that arise from Daniel Fallman's (2008) design exploration model for interactive design research, which are reinforced by John Wilder Tukey's (1980) acknowledgement of the exploratory as a fundamental attitude and flexibility in data analysis.

The study brings forward solid connections between the exploratory and descriptive nature present at its very core, the exploratory characteristics of general and specific research practices such as the ones enunciated in Fallman's research model, the exploratory as a complementary attitude in data-related analysis for statistical purposes, and finally the ones used by artists and other practitioners in their database-based projects. From an exploratory point of view, this research renders the parallelisms among researchers and database practitioners evident for purposes other than research, and the study places itself at a meta-level as the subjects and methods present on the data it collected and analyzed echo the methodological approaches of the study's research process in itself.

Outline

The first section introduces the subject of the study and discusses the relevant and available literature, defines the purpose of the study and its theoretical framework, presents the study's research design and the data procedures, and provides for a detailed factual description of the study's collected data, while laying the foundations for the analysis of the data.

The following section focuses on the analysis of the collected data and its findings in the light of the defined exploration model categorization. The established core category system reports a total of six categories, divided into four main individual categories or themes: Societal, Political, Transcendental, and Aesthetical, with two additional ones, grouping several sets of interrelated characteristics: Conflations and Given. The core categories in the study's framework disclose a set of key features such as a category label and the corresponding description of its key characteristics, scope and limitations, the illustrative data associated with each category, and the potential linkings between other categories. The core category system is embedded in an open model network framework with no hierarchy or system.

The final section presents a discussion summarizing the study, the interpretation of the findings, the limitations and restrictions of the study, and the suggestions for furthering the research.

Findings

Societal

The connection of the Societal to exploration is observed in Fallman's tryptich model for interaction design research and its contribution to what may be understood as three different design research activities: design practice, design studies, and design exploration. Placed at Fallman's triangular model extremes, each of the design research activities provide a link or an external interface to a specific vital area of action or influence: design practice interfaces with industry, design studies with academia, and finally, design exploration with society.

To Fallman, the design exploration branch of the model is the one that better provides an interface with society at large. He states that its artifacts are often ways to comment on a phenomenon, and without overhead explanations, become statements or contributions to ongoing societal discussions and thus having a voice in shaping the future (Fallman 2008:5,8). Design exploration projects' expression is said in Fallman & Stolterman (2011:269) to be societal, and a way to comment on societal or cultural phenomena by bringing forth artifacts that in themselves make statements, offer arguments, or in other ways contribute to ongoing societal discussions or shed light on certain circumstances or events. To summarize, Fallman (2008:8) argues that design exploration is societal in its expression, and its artifacts are often societal in character, and sometimes even subversive.

As cultural artifacts from one sort or the other that use data as their source material, it is hardly the case that the projects comprised in the study's data sample do not demonstrate traits of a connection to social matters in particular and society in general. Data production, collection, and analysis takes place in social contexts and among social interactions, and so does most of the areas of activity in which these projects were imagined and materialized. The choice for the data as evidence of societal categorization that follows pertains projects that more explicitly demonstrate a conscious exploration of societal issues, whether by providing direct involvement in social contexts, by offering exhaustive commentaries on social phenomena, or by overtly aiming at social transformation and change. Other projects in the study's data that despite showing societal aspects, express a better fitting into other categories, will be referred as such accordingly.

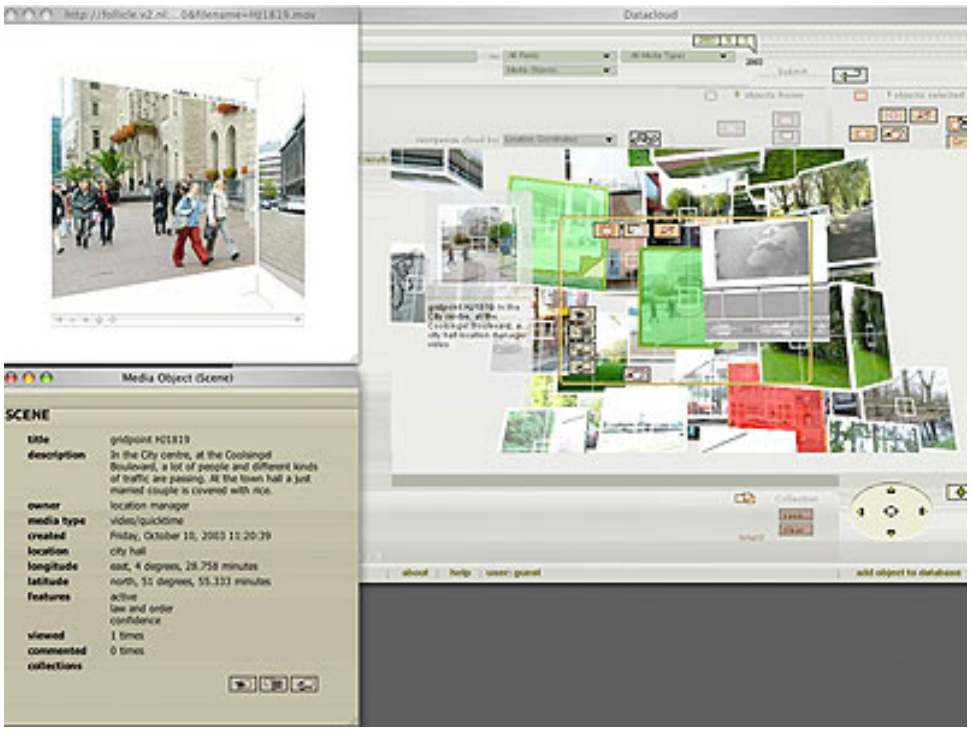

Fig. 94: DataCloud (Archined, Stealth and V2_Lab 1998-2004).

DataCloud, the Dutch project that deals with urban data and its accessibility to the general public, constitutes a first example in the study's data of a project with a

strong societal character. Another aspect that makes this specific project of significance to the present study, is the fact that this was the first project relating specifically to data, even explicitly in its denomination, that brought the main subject of this study to our attention.

The project, a cross-disciplinary effort described in detail in the data section of this study, developed over a time-span of six years and outputted three different instances on the process. The first installment, *DataCloud 1.0* and aka *DWHW, Datawolk Hoeksche Waard,* worked as a community tool to collect, discuss and browse both factual—figures and images, and more fuzzy data—stories and sounds, about *Hoeksche Waard*—an area close to Rotterdam. Its *2.0* version evolved to contain media-objects represented as spatial elements within a 3D navigable environment, and acted as an archive of observation and abstractions of the research on uncontrolled urban processes in the city of Belgrade. As to the later versions, *2.5* focused again on the shifting urban domain if the City of Rotterdam from a cinematographic perpective, and *2.7* as an interface for the presentation of the design project, *The Office of Alternative Urban Planning, TOOAUP,* by the students of the Berlage Institute at *Manifesta 5,* in San Sebastian.

Among the explicitly societal characteristics of *DataCloud* are the ways in which the project allows its users to directly contribute and comment on other users' contributions to the project's contents, and indirectly participate in a broader discussion pertaining the issues that are at the core of the project's articulation with the urban environment. As it is stated in its concept, the *DataCloud* information space is navigable and able to be explored from different layers of information that can be discovered and reorganized to suit the user's particular interests and preferences. Furthermore, users can also go beyond the search environment and reflect and comment upon the content. This trait turns *DataCloud* into a tool that is able to support a broad based social, strategic, and political dialogue, that is needed in the development of complex issues such as urban development.

Anne Nigten (nd), one of the project's application developer from the *V2_* team, claims that the fact that the tool provides editing functionalities to its authorized users, that are combined with a newsgroup facility, turns the *2.0* version into an

effective information tool that can support a community. She claims that the *2.0* version research focuses on some major topics deemed relevant to enhance audience participation, and through specific interface techniques, achieve personal involvement. Commenting on the question of how much the user can influence creating both content and presentation forms, Frieling (2004) refers to *DataCloud*, which he designates a didactic and exploratory mediation project, as attaching great value to the collective and discursive process of generating and presenting data, constituting not just a tool for presenting relationships dynamically, but also a way for strengthening links within a group or community.

Fig. 95: Field-Work@Alsace Screen capture (Fujihata 2002).

Masaki Fujihata's *Field-Work@Alsace* (2002) engages directly with society and tries to find a novel way to plasm its stories and collective memories. The project is an instance in a series of projects designated *Field-Works* started in 1992, that reconstruct collective memories into Cyberspace as a kind of video archive by using its position-data captured by GPS. The *Alsace Field-Work* project comprises a collection of interviews with locals and travelers around the Alsace border between France and

Germany, shown in the location where they took place and replayed across space and time according to the original camera motion on location.

Manovich (2008:85) refers to Fujihata's Field Works in the context of media hybrids stating that they place video recordings made in particular places within a highly abstracted 3D virtual space representing the place. He adds that Fujihata pioneered 'locative media' work with his *Field Studies* in the 1990's, a decade earlier before the term made its appearance, having to build its own custom hardware in a time when cameras with built in GPS didn't commercially exist.

Fig. 96: Field-Work@Alsace Capture from Dv tape Alsace (Fujihata 2002).

Apart from pushing the medium and pioneering future models for interfacing reality through peoples stories, Manovich (2008:86, 87) adds that *Alsace* represents a particularly interesting media hybrid as it fuses photography, video documentary, locative media, 2D motion and 3D orientation, within a 3D virtual space. The project results in a new way to represent collective experiences in an overall immersive coordinate system. Fujihata found a simple and elegant way to render the subjective and unique nature of each video interview. He does so by situating each rectangle

container at a particular angle that actually reflects the original position of the camera during the interview.

Fujihata (Shaw & Weibel 2002:417) argues that it is extremely difficult to put across events from memory to others, unless one can get beyond explanation and get others to experience for themselves, as the ultimate meta-explanation.

Fig. 97: Deformed result from Impressing Velocity in 1994 (Fujihata 1992-1994).

Another project by Fujihata, titled *Impressing Velocity [Mt. Fuji]* (1992-1994), started the *Field-Works'* series. The project literally impresses the climbing velocity of *Mt. Fuji*—undertaken by Fujihata and a group of climber friends in 1992—into a three dimensional representation of the volcano. Once again a project engaging a group of people in an outdoor collective participatory activity is the starting point for the initial data collection. This data will susequently feed the project's core acting as the basic material to model its output by shaping its images and defining its aesthetics. Fujihata (Shaw & Weibel 2002:422) states that the project represents a schematic conversion of the extent of fatigue into pictorial form. *Impressing Velocity* makes use of a social interaction event as a drawing machine, as well as a device to once again

pursue novel ways of representing the world through the creation of unusual experiences in perception.

If *DataCloud* was one of the first projects that came to the attention of the researcher that explicitly placed data at its core, and Fujihata's *Field-Work@Alsace* one of the first, in the study's data, that the researcher saw presented by its author in the digital arts festival, *Olhares de Outono,* in 2002, in Porto, and as such constitute two key foundational projects for the study's context, the *C5 corp's* work, is the main conceptual motivation for this project.

Fig. 98: Castle Crags, Shasta County, 3:00 pm, Saturday, April 9 (C5 2005):

From its inception, the *C5 corp* philosophy, structure, working contexts, and output constitute an intrinsic societal activity. *C5*'s multidisciplinary trait makes no distinction between the research ambitions of business and art. They state that the opportunity to conduct research that is contextualized by both fields is unique of their culture, and that the emergent theory of said efforts serves to define conceptual methodologies, techniques and strategies appropriate to both worlds.

The Corporation slash Research Organization created by *C5* is dedicated to the pursuit of new developments in technology, theory, and art. It does so by structuring itself as a corporation that includes the full regalia of its organizational methods, including the finance, governance, marketing, and the research elements. Its motto as Theory as Product, places its specialization in cultural production informed by the blurred boundaries of research, art and business practices.

Fig. 99: The Perfect View, San Francisco Camerawork, 2005 (c5 2005).

The series of projects developed under the umbrella of *The C5 Landscape Initiative,* initiated in 2001, and part of this study's data, involved mapping, navigation and search of the landscape using Geographic Information Systems. Taking place over a period of five years, *C5* claims that they worked as an extension of their exploration into data visualization systems as art, and that they examine the changing conception of the Landscape as we move from the aesthetics of representation to those of information visualization and interface.

C5 acknowledges the availability of instrumentation capable of creating a detailed mapping of the surface of the Earth from the space and that like the mapping of the

human genome, the scope and implication of such mapping asks for tremendous social, political and economic considerations, and that the conception and interaction with the Landscape is becoming an issue of the database.

Fig. 100: The Analogous Landscape, San Francisco Camerawork, 2005 (C5 2005).

The context in which *The C5 Landscape Initiative* was created is deeply intertwined in a set of new discourses and disciplines that have emerged around topics such as Interactive Mapping and Archeological Geophysics, new data products resulting from the technology transfer from GIS research and present in Environmental Studies, strategic management of resources and hazards and disaster analysis. The emergence of an entirely new relationship with the Landscape taking form in applications for simulation, surveillance, resource allocation and management of cooperative networks that the technologies of Spatial Data Systems and Global Positioning Systems have enabled.

It is in this context of technological global probing and all the referred collateral implications that *The C5 Landscape Initiative* sets as its objective to make open source software available, and as such express its essential societal core by allowing anyone to pursue the trajectories enabled in the series of *The Landscape Initiative.* Referring

to *The C5 Landscape Initiative,* Paul (2005) states that the project is positioned in the overlapping zones of Conceptual Performance and Land Art, as well as research, business, and exploratory adventure, raising questions about the contexts in which meaning is constructed and about the status of exploration in art itself.

Fig. 101: The C5 GPS Media Player, San Francisco Camerawork, 2005 (C5 2005).

The diverse nature of their projects, working materials and processes reflect a distinct mixture of Scientific Research, Performance Art, and Sports activities that results of the combination of their interest in areas of outdoor recreation and land use such as Hunting, Fishing, Performance Art, Off-Highway Vehicles use, Land Art, and other team/collaborative activities wich include a wide range of sporting events such as Cycling and Endurance Racing.

The public release of the *Landscape Database* application reflects Stalbaum's (2004a) interpretive framework for contemporary database practice, as a *database formalism,* particularly the demonstrated interest in the actual materials modeled by data, as well as the quest for new exploratory methods of interacting with the material world which reveal new knowledge about the materials, about the possible interactions

with them, and about how to allow the data to be cooperative co-participant in the Performance.

Stalbaum (2004a) states that *database formalism,* understood as one of the modes to interpret contemporary database practice, along with database politics and data visualization, is a tendency in which database is conceived as a virtual context for implementing a data-cooperative mediation of the world. Its goal is to realign the power of the database to distribute the real, while conceiving the agency that is returned back to the hands of the people who interact with such systems. It encourages individuals to develop related expertise and to produce ecologies of knowledge, whether for political or apolitical ends. It also adds that the database formalist mode allows the aesthetic analysis to move towards and to explore truly interesting, but purely formal issues of the database as a medium, and that, for example, the relational database model's ability to maintain *ad hoc* queries may be consequential in terms of how the material world is ultimately mediated in particular instances.

Not only *C5*'s model of work, expressed as a cross-breed of working philosophies and leisure activities across disciplines and social contexts, is deeply societal, but also its products' aims are keenly transformative. Society is welcome to experience *C5*'s work results. In *C5*'s *Landscape Initiative* exhibition the viewers are invited to interact with *C5*'s expeditions while exploring their relationship to the land in a data driven world, but most importantly, they can make use of the open source software produced by *C5* to pursue the projects' trajectories and become agents themselves in shaping possible futures.

The File Room (1994-), by Antoni Muntadas, is a pioneering web-based piece, both an online database and the re-creation of a historic installation first exhibited in 1994 at *Randolph St. Gallery,* consisting of a room of file cabinets, a table and computer station at which visitors could browse and contribute to the online File Room—an open and updatable catalogue of instances of censorship.

As an open system that roughly touches the function of a social service utility, *The File Room* is referred by Dietz (2004) as pointing to a very different model of bi-directional information flows, constituting a bottom-up system in which the

contributors write the history of censorship through their own personal experiences, perform collaborative filtering, deliver multiple points of view, and transgress geographic and discipline boundaries, in a project that blends specialist and non-specialist in the same story line.

Fig. 102: The File Room (Muntadas 1994-).

Vesna (2000) argues that *The File Room* is devoted to document cases of censorship that are frequently not available at all or else exist somewhere as *dormant data,* while Frieling (2004) says that it responds to the connection between exclusion and (art-) political censorship by collecting cases of censorship from all over the world via the Internet, subsequently making them available to anyone there as a collection of documents, that emerge as a counter-archive to postulated official writing of history.

Of course, both Antoni Muntadas' *The File Room* and Sawad Brooks' and Beth Stryker *DissemiNET* (1998) could as easily be categorized under the Political section. Dietz (2004) refers that *DissemiNET,* as a data-driven compilation of user-defined stories parallels open archives such as Muntadas' *The File Room,* for the fact that anyone is allowed to upload their stories in relation to the explored topic. The project is described as a curated and public participatory system, that is conceived to

elaborate a diaspora on the web, and that by drawing a parallel between real diasporas and the dispersal of meaning over the Web, provides spaces for people to recollect and retell their stories and their experiences about homelessness and dispersal.

DissemiNET's societal and political traits are expressed in its authors use of the Internet to collect, store, and disseminate stories recounting the "disappearance" of youths during the El Salvador civil war. The stories were gathered in collaboration with an agency, *Pro Busqueda de Los Ninos,* that helps to trace children abducted during the conflict.

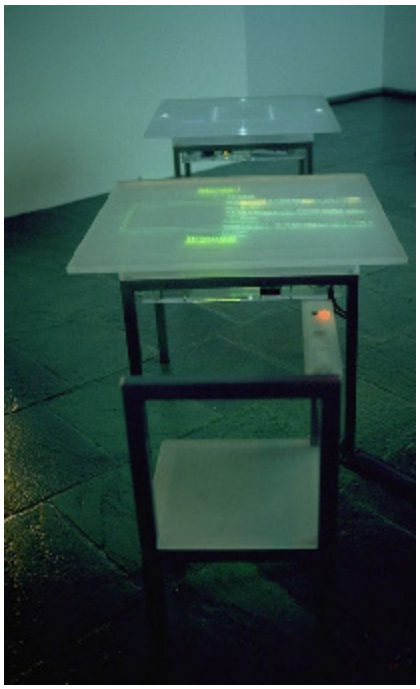

Fig. 103: DissemiNET Telematic Tables (Brooks & Stryker 1998).

The societal aspect in *DissemiNET*'s as an installation is operated by an interface between its transient public space location and the *DissemiNET* Web-space, making use of two free-standing multi-user hardware/software telematic tables in which the local communities can view and input (collection) and output (recollection) stories. The way in which the stories can be retrieved by search words, themes, or key-concepts, allowing the system to automate connections among them and display those connections in an interface called "crossroads", is also an argument for exploration, both by the piece, by allowing the unexpected, and by the users, for their active part

as explorers. The investigation of semi-automated storytelling in very large datasets is also referred by Dietz (2004) by stating that the fuzzy algorithm that operates in *DissemiNET* "curates" the database by creating relationships among the data that outputs as stories.

If the explicit social entanglement in art is not new, the power of data as a social actor, expressed in their strong connection to the real world, and their role as an assistant to fundamental discoveries and influence social policy and economics (Diamond 2011), expands these project's dimensions as incisive arguments in societal discourse. This use of data, whether contributed by the audience or as a result of personal research, is also clearly patent in Hans Haacke's *Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 through August 8, 1971* (1971), and Mark Lombardi's *George W. Bush, Harken Energy, and Jackson Stephens, ca. 1979-90 (5th version),* from 1999.

Fig. 104: John Weber Gallery Visitors' Profile 1973 (Hans Haacke 1971).

Visitors' Profile is in tune with Haacke's definition of his art as an analysis and reflection on social structures. It uses a conjunction of demographic questions with current social and political ones, and through computer assisted technology calcu-

lates the statistical data in real time so the system responsively gathers and evaluates information about the systematic relationship between art and society (Shanken 2002:435) that is presented in real-time to the public/contributor visiting the exhibition.

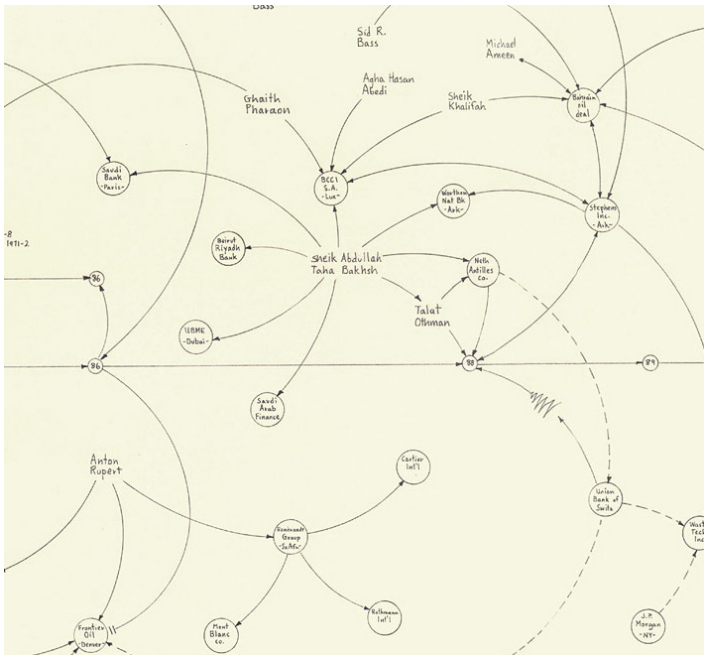

Fig. 105: George W. Bush… detail (Lombardi 1999).

What Haacke's *Visitors' Profile* achieves through the implementation of a collaborative computerized real-time system, Lombardi does through the data visualization of a thorough personal investigation in a monumental series of drawings in which he depicts complex narratives about his research interests, and that range from failed banks to corruption in organized crime. Initially not intended to became artworks, and playing the role as exploratory steps to clarify Lombardi's reasoning about those stories, Fry (2009) states that in the years to follow, Lombardi's images became sophisticated networks that told exceptionally detailed stories by themselves, and illustrate the importance that working with data has to the future of design.

The deeply political and social resonance of Lombardi's pieces, is, in this particular case, manifest in its focus on the roles that cronyism and insider trading played in the fortunes of George W. Bush in the 1980's. The mapping in the piece concludes with the year 1990 and the figure "$848 K", together with the notation "July 1990

Bush bails out w/ profit. Two weeks later Saddam Hussein invades Kuwait" (Hobbs 2003:100).

Fig. 106: Exactitudes 66 Babes - Rotterdam 2005 (Versluis & Uyttenbroek 1999).

Exactitudes, by photographer Ari Versluis and artist/profiler Ellie Uyttenbroek, is a photographic project in progress since 1994, that according to Brouwer, Mulder & Charlton (2003:42) can be regarded as a sociological study of multicultural society, and as an attempt to expose the cultural signs that identify a certain subculture and trace their common denominator, as if people were a collection of data that can be described with metadata (Brouwer, Mulder & Charlton 2003:44). *Exactitudes* plays with the contraction of the words 'exact' and 'attitude' to humorously reflect on the social paradox of individual expression versus our (un)intentional identification

with specific groups' identities and their personal collective traits. The project's social categorization toward what Masahiko Sato (2010) calls a definition of self, plays on the notion of our self perception against the perception of others about ourselves, and the fact that despite our perceived originality about ourselves, we will always surprisingly belong to some sort of group or category of people.

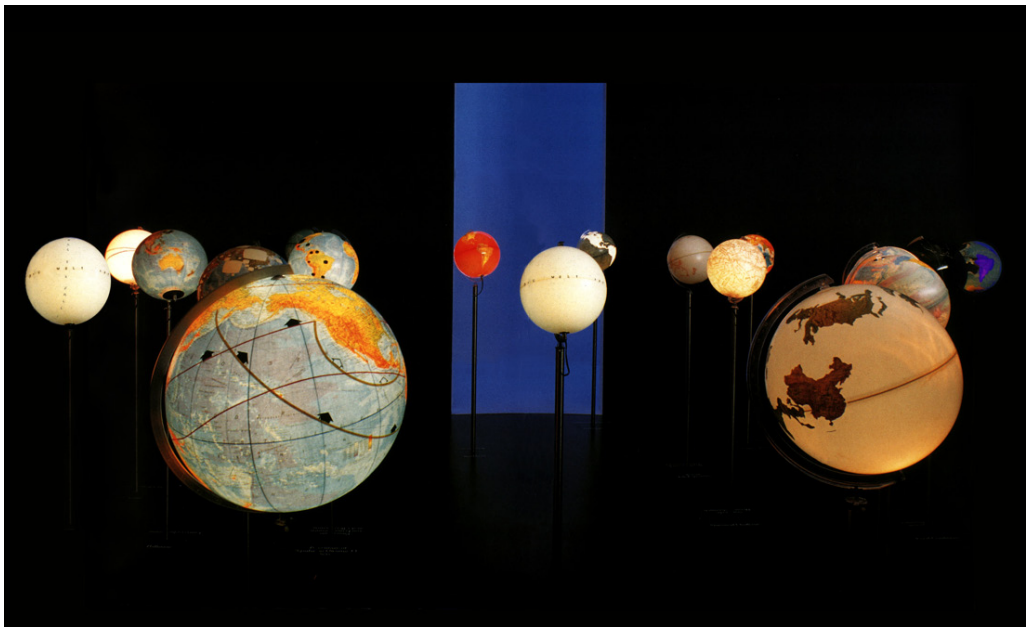

Fig. 107: Worldprocessor Installation view (Günther 1989-).

Worldprocessor (1989-), by Ingo Günther, uses a collection of about 300 illuminated globes to visualize sociological, political, and scientific phenomena and highlighting global issues such as the geographical distribution of various parameters, including relative military expenditure, temperature changes, population, energy consumption, pollution, wealth, refugees, life expectancy, and so on. Frieling (2004) argues that *Worldprocessor* uses a mapping strategy where data is used to transform objects. He adds that Günther picks up the globe shape in order to generate an abundance of interpretative maps of the world, in a critique of the predominant view taken by the political world map.

Also shaped as a globe, Yasuhiro Suzuki's *Globe-Jungle Project* (2001), plays with memory and cinematography on an outside installation of a 'Globe-Jungle', which is a circular climbing frame (very popular in the last decades in Japan), and is part of a

larger project in Japan for redesigning city parks, and promoting cross-generational contacts between the young and the old. Yasuhiro's project uses the energy of daytime children playing to stimulate the memory and the senses of visitors at night. During the day, a couple of video cameras record a daytime archive of video images of the children playing and their surroundings through their perspective from inside the globe. At night, the visitors can access the projected images on the globe by rotating the structure whose bar acts like a reflecting surface screen in a cinematic-like afterimage illusion (Brouwer, Mulder & Charlton 2003:51). Just as in Fujihata's projects, Suzuki seeks the public engagement through novel ways of interfacing images and memories. To Suzuki (2002), the nostalgic illusion created by the act of turning the globe, bring forward an emergent space where technology and memory are linked and naturally fused together.

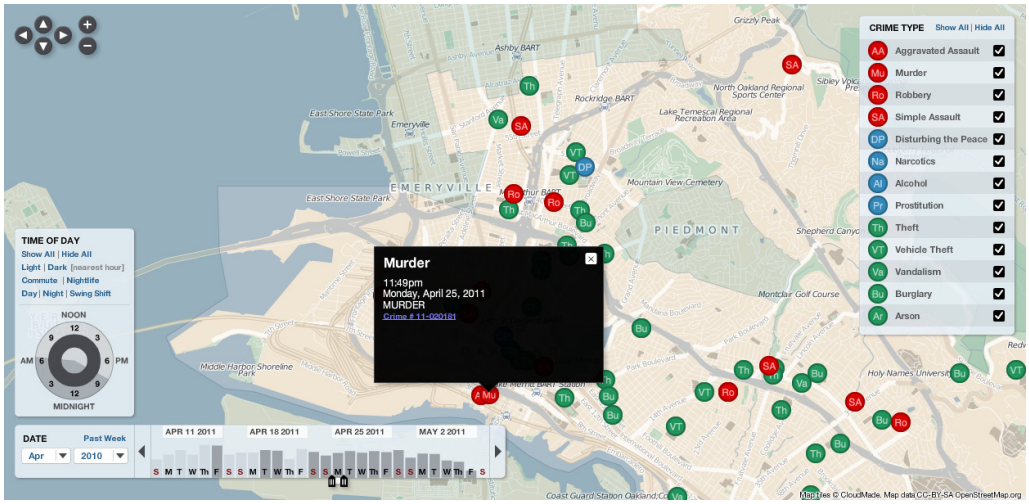

Fig. 108: Oakland Crimespotting (Migurski, Carden & Rodenbeck 2007).

Stamen's Oakland Crimespotting (2007) societal trait is readily observable in their authors' description of the project as an interactive map of crimes in Oakland and a tool for understanding crime in cities based on citizen's rights to information and the notion that a clear understanding of their environment is essential to an informed citizenship. They add that *Crimespotting* enables us to do more than search for the things we already know, by addressing our need to explore public information, to draw connections, and to see new possibilities for questioning. Furthermore, Stamen express their belief in open exposure of civic data to the public, and through their project they seek to inspire local authorities to use their data visualization

model for the public release of other kind of data such as tree plantings, new schools, and any other information relevant to public communities and their neighborhoods.

The project's dynamic relation to society is expressed in its relation to how it is used and how that use determines its own evolution as a public tool. This is expressed in Michal Migurski's description of the story of the project, stating that on a first instance the data is extracted from the *Oakland Police Department's* Website home into a format that is compliant to slicing and mixing, then it is made available to the public to be used by local citizens in a dynamic website. Finally, a survey of how it behaves, revisiting initial assumptions and responding to public feedback takes place.

Fig. 109: ./logicaland Oil Consumption (Gusberti et al. 2002).

./logicaland's (2002) main characteristic as a collective and participative simulation game that is based on data gathered by a global world model from the 1970s, and that simultaneously visualizes our world's complex economical, political, and social systems, testifies to its societal nature that is also expressed in the way it engages

people into strategies of raising human sensibility and responsibility within the global networked society.

The authors claim that *./logicaland*'s main idea is to provide the public with a web-based world-simulation within a participative environment that allows its users to contribute with their influence to the system in order to reach an understanding of how global interrelationships unfold and how serious change is effected only through a common effort in such specific system. In accordance to its societal expression, the *./logicaland* software is free and its source code, is available for download through their website, and released under the *GNU GPL License.*

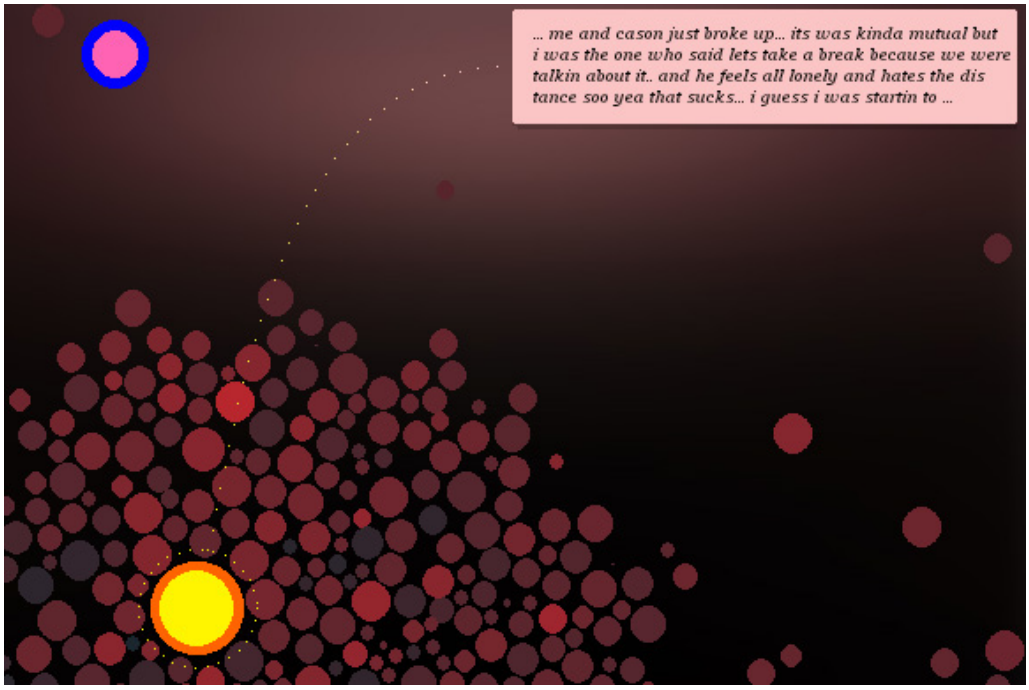

Fig. 110: The Dupster detail (Levin, Nigam and Feiberg 2006).

The Dumpster, by Levin, Nigam and Feinberg (2006), is a browsable visualization that depicts a slice through the romantic lives of American teenagers by aggregating and making visible in one navigable place, millions of textual romantic breakups extracted from blogs during 2005. The textual data samples are about one person 'dumping' another, hence the name of the project, *The Dumpster*, that the authors claim to reveal the astonishing similarities, the unique differences, and underlying patterns of failed relationships. Levin (2006) confirms the transformative potential

of information visualization by stating that whether relating to a single participant, to the information culture we inhabit, or the formal aspects of mediated communication itself, when used as an interrogative mode of artistic practice, it has the potential to offer us a new perspective of ourselves.

Manovich's (2006) essay on the project calls it a social data browser, an example of social portraiture, documentary, and database art, whose emotional subject asks us to consider the paradox that the same few decades of the 19th Century that gave us the most detailed depiction of romanticism, inner feelings, and human emotions in the arts, also saw the rise of statistical and social imagination.

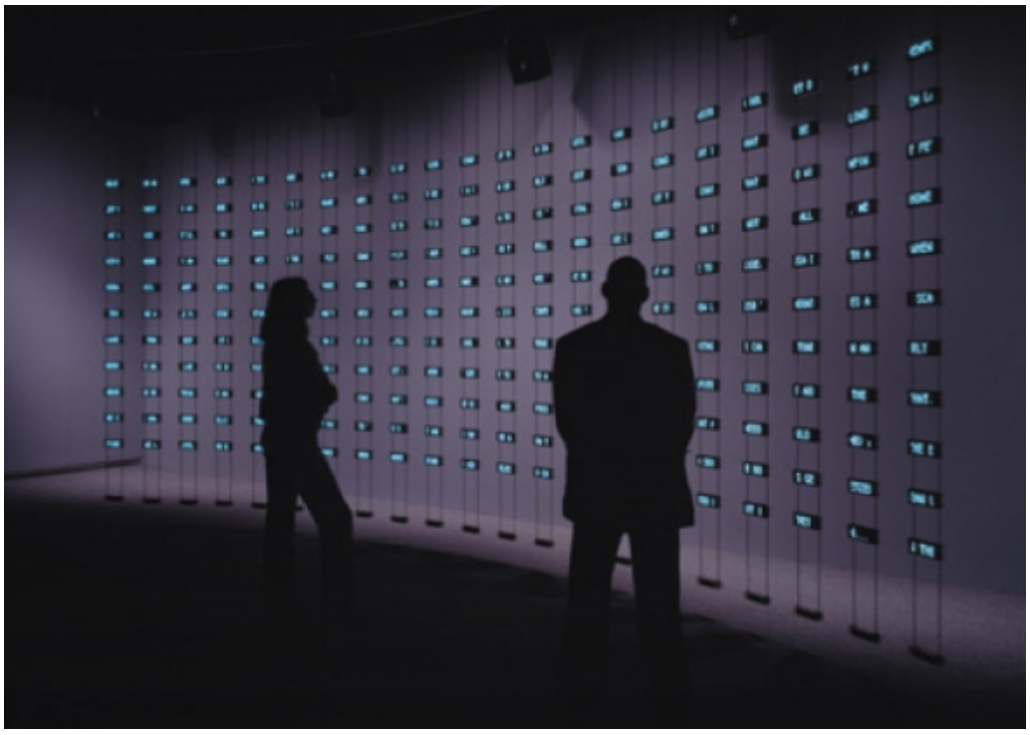

Fig. 111: Listening Post Installation view (Hansen & Rubin 2002-2005).

Listening Post, by Hansen & Rubin (2002-2005), also extracts textual data from thousands of unrestricted Internet chat rooms, bulletin boards and other public forums, in realtime, that then are parsed, sorted and analyzed in order to be read by a voice synthesizer, and simultaneously displayed across a suspended grid of 231 vacuum-fluorescent screens. The words 'dynamic portrait' of online communication and an ode to the humanity behind the used data are some of the expressions

describing the project, that albeit its evident societal trait will be analyzed in a more thorough fashion in the category pertaining to Transcendence.

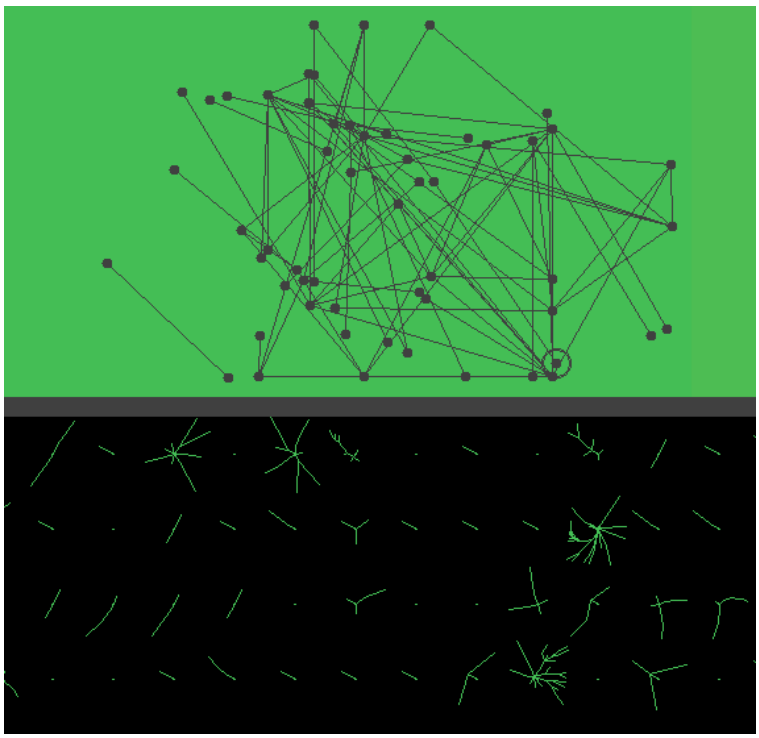

Fig. 112: Conversation Map of Empyre for jan 1 - 14 jun 2010 (Sack 1997-2000).

Warren Sack's *Conversation Map* (1997-2000) and *Agonistics: A Language Game* (2004), also probe the arena of social interactions by acting as interfaces for what Sack calls "Very Large-Scale Conversations", such as the ones happening in Internet newsgroups, electronic-mail lists or busy, Usenet Newsgroups, and analyze its contents in order to create graphic interfaces to make visible the social and semantic relationships that emerge over time (Sack 2000). *Conversation Map*'s use as a tool for self-reflection during the American George Bush / Al Gore presidential campaign is acknowledged by Frieling (2004); its role in facilitating an understanding of very large-scale conversations referred by Dietz (2004); and its application to particular forms of communication environments such as e-mail and online chats where the lack of crucial information about social interaction occurs, noted by Paul (2008:189). *Conversation Map* extends two tools from the social sciences—social networks, and semantic networks— and transforms them through interface design into useful interface devices, as well as a mean to summarize, explore, and cross-index the large

volumes of data in social semantic networks in order to facilitate the understanding of the social and semantic structure of very large-scale conversations (Sack 2000).

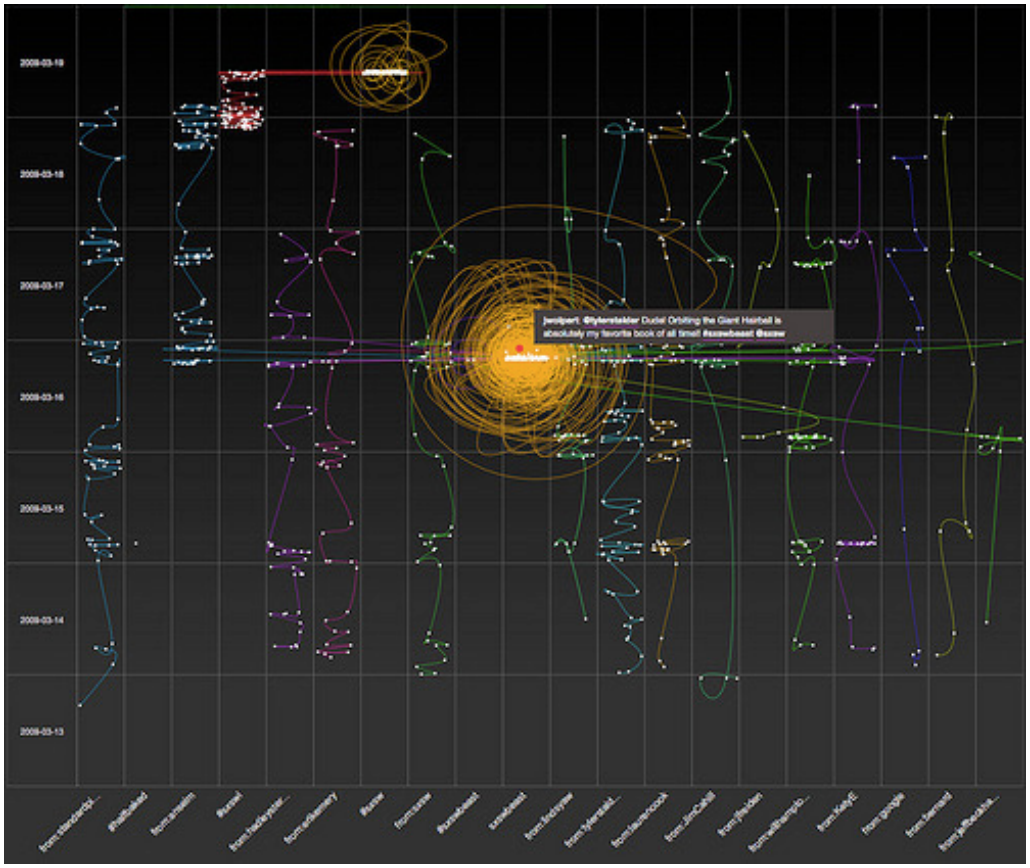

Fig. 113: Social Collider (Schmidt and Pohflepp 2009).

Social Collider, by Schmidt and Pohflepp (2009), closes the cycle of projects working with data extracted from social media contexts, in this particular case visualizing the cross-connections between conversations on the *Twitter* social network. The project establishes relations between the personal data traces and the lateral collective context, and, according to its authors, acts as a metaphorical instrument that exposes the way memes get created and propagate, ideally catching the *Zeitgeist* at work. The *Collider* explores both temporal and lateral perspectives on data trails; it starts with messages on the microblogging-platform *Twitter* and uses user input of search strings such as usernames, topics or trends, visually expressing its resonance in the collective discourse by spinning off and horizontally link to user or topics who relate to them.

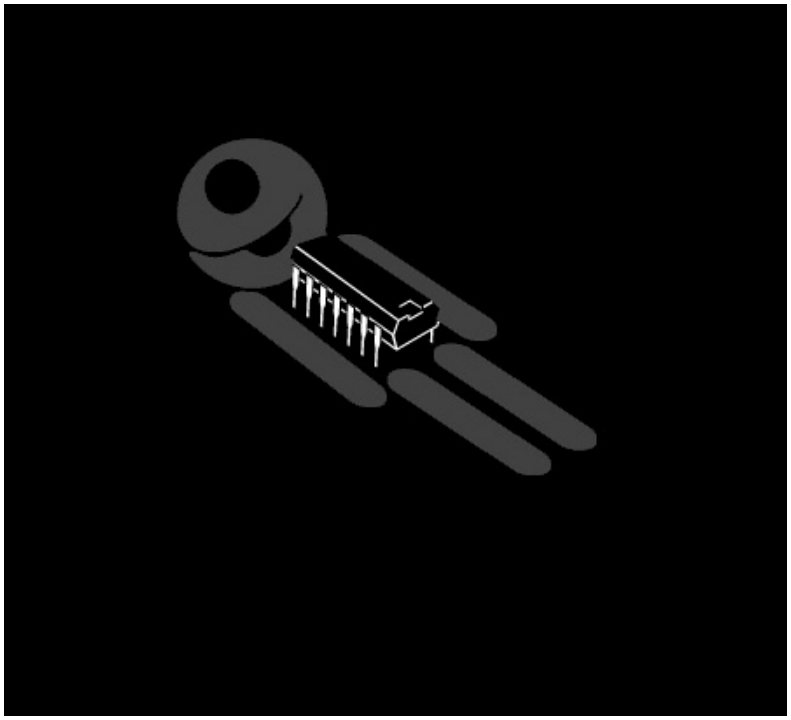

Fig. 114: Nine(9) (Harwood & Mongrel 2003).

Nine(9), by Harwood and the Mongrel Collective (2003), is a piece of software art for workshops and working groups, developed in the context of a specific social practice, that addresses mapping as a collective process (Frieling 2004). The software allows communities, in the cities where Mongrel's activities are developed, to participate in an engaging self-representation that provides a powerful experience for outsiders (Dietz 2004). These communities are active participants in the very own software development, in Harwood's words; directly born, changed and developed as the result of an ongoing sociability between users and programmers in which demands are made on the practices of coding that exceed their easy fit into standardized social relations. Dietz gives a description of the software in greater detail as an online space that allows each participant to create a "knowledge map" by uploading text, sound, images and video; and composing them according to a recurring pattern of nine elements and linkages. These build up into a grid of hundreds of interlinked maps that become both an expression of each participant's personal experiences and a way of visualizing the communal interrelationships amongst them (Dietz 2004).

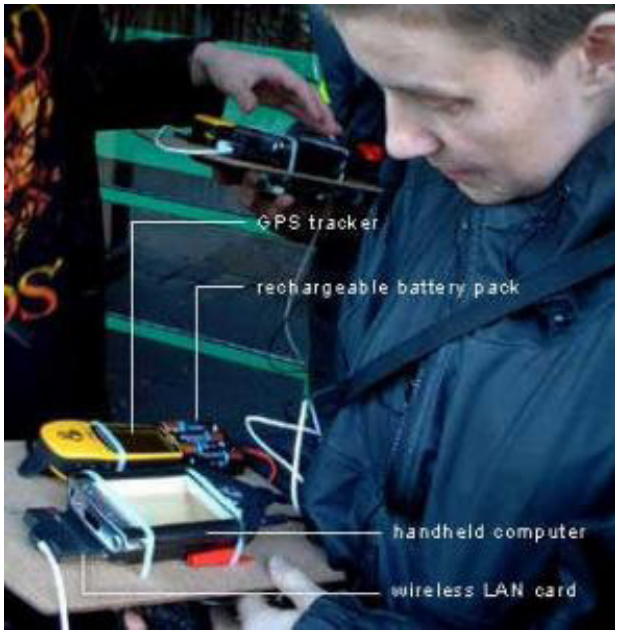

Fig. 115: Can You See Me Now? (Blast Theory 2001).

Can You See Me Now? by Blast Theory (2001), is a mixed-reality game that is played simultaneously online and in the streets during a period of five days. While players in this mixed-reality game log on its website online, their avatars are chased by Blast Theory pawns in the real world until they're intercepted, and the mapped chase collected with photographs to be archived in the project's database (Brouwer, Mulder and Charlton 2003:83). *Can You See Me Now?* operates a conflation between the physical and the virtual environments, and gives its players a personal experience of data, because, as van Nierop (2002) refers, even if the human aspects in the game are translated into digital data and look impersonal, the players' experience is not detached from the game and the excitement purely results from their imagination. What *Can You See Me Now?* shows, and van Nierop points out, is the flexibility of how human imagination, particularly through game-play, can either represent itself in data or identify itself with data. This shows the potential for affection that these particular participatory platforms have for social interactions, especially when there's a possibility to contribute to a dynamic living archive, because as van Nierop concludes (2002), and as far as human imagination is concerned, the digital extension of reality is just another realm for the projection and identification of a sense of self.

Fig. 116: Hello, Weather! (Polli 2008).

It is also significant to reference *Mobile Scout: A Field Guide* (2004), a project that uses telephones and Interactive Voice Response technology to allow the audience to record their experience of place, and in that way build a sonic field guide database describing its flora, fauna and behavior that is later made available on the Internet. If Bleecker, Paterson and Zurkow's *Mobile Scout* turns people into amateur geographers, Andrea Polli's *Hello, Weather!* (2008), a project that consists of public weather stations that gather weather and climate data, calls to our environmentalist heart. Among the project's aims are the de-mystification of the collection and use of weather and climate data by the general public, the investigation of cooperative media in the context of weather and climate observation and science, and, by making available the gathered data for other agents to explore, *Hello, Weather!* intends to be a project seeder and a catalyzer for an array of eclectic approaches.

Fig. 117: Technological Dreams Series: No.1, Robots (Dunne & Raby 2007).

The work of Dunne & Raby, self-referred as "Critical Design", is for Fallman the model of exploration and its societal embroilment. In fact, Dunne & Raby's (2007) characterization of Critical Design's purpose as something that working from within the field and language of design seeks to make us think, raising awareness, exposing assumptions, and sparking public debate about the social, cultural and ethical impact on everyday life of emerging and future technologies, displays every aspect of something that is supposed to contribute to the ongoing societal discussions and aim at shaping the future by questioning the present.

The *Statistical Clock* is a foam and electronics device, similar to a microphone yet doubling as a speaker, that connects wirelessly to the Internet. It scans the *BBC News'* feeds searching for data related to technological mediated fatalities (car crashes,or train, plane crashes), that it then pulls into a database. Each technology has attributed its own numerical channel. The clock checks its source periodically, and if it finds a new occurrence, it then speaks it out loud numerically… 1, 2, 3. Debatty (2007) argues that the object is meant to re-sensitize oneself towards such type of events that seem to have lost all impact due to media over-exposure, and that the feeling

of listening to the clock reconnects us to the reality behind statistics, and genuinely gives meaning back to something that is often abstracted by statistical processing.

Statistical Clock also fulfills one aspect of the design exploration typology in Fallman's model, as a piece of design that, rather than being driven by how well the product fits into an existing or expected future market (or the observed needs of a group of users), becomes a statement of what is possible, of what would be desirable and ideal, or just shows an alternative or an example.

Political

The Political category can either be understood as standing on its own as a category pertaining exploration with databases, or as a sub-set of the Societal one, in which the included project examples denote an essentially political quality. Although the societal examples are not also necessarily political or demonstrate political concerns, the political ones are always societal. It is out of the scope of this project to give an accurate context-specific definition of what politics and political topics or actions are. For the context of this study, the general application of the term political as concerning the way people make collective decisions in order to run governmental or sate affairs that affect us as individuals, or in a more general sense relating to all kinds of social relations involving issues of authority, power, and control, will suffice. Furthermore, the listed projects themselves will contribute to a more comprehensive illustration with their own political approaches to and through data exploration.
Although Fallman (2008) and Fallman & Stolterman (2011) do not elaborate on the political as a relevant aspect in design exploration, it is listed in Fallman's (2008:14) figure 3—depicting a more complete model of interaction design research—right after Societal, and Critique.

Mark Lombardi's (1951-2000) work reflects his interest on information and on depicting deeply societal complex narratives on issues that range from failed banks to corruption in organized crime. *The George W. Bush, Harken Energy, and Jackson Stephens, ca. 1979-90* (1999) piece, that depicts the story of former President George W. Bush, before he was governor of Texas, is described in detail as part of the Societal category, but also has deep resonance concerning political issues, particularly

the opaque relations between politics, power, business, finance, government, army, terrorist networks, organized crime, and conflicting interests among the involved parties.

Lombardi calls his pieces "narrative structures", consisting of a network of lines and notations that convey a story about a recent current event that interests him. He states that one of his goals is to explore the interaction of political, social and economic forces in contemporary affairs, and he does so by following similar steps and methods of a common research project in social sciences. He collects public data, reviews it, synthesizes it, and conveys it as a coherent and unified whole.

Fig. 118: Zone*Interdite Camp Bucca Iraq (Watcher & Judd 2006).

*Zone*Interdite,* by Watcher and Judd (2006), deals with the geographical blackouts that restricted military areas represent to our perception of the world. The authors claim that their artistic ambition with *Zone*Interdite* is the will to gain their view of the world freed from said blackouts masking their perception. This is done via people's contributions by sending information concerning forbidden-access places,

and some of those areas are reconstructed as artificial 3D virtual worlds, some, like one featuring the Guantanamo Bay with its prison camps and another an Islamic training camp in Sudan, are available for download at the project's website to be personally explored as a virtual walkthrough.

It is stated that the power of the project lies in the disarming and lapidary view of a world of military power, in which individual imagination and the joy of discovering contribute to the undermining of censorship and the restriction of perception, and allow its users to gain the possibility to realize what freedom and self-determination can or could be. The role of the project in collecting, localizing, and mapping those blind spots relates to its attempt as a tool to allow its users to regain agency upon the world and take ownership of our own terrain in order to experience the world more completely. Culatti (2006) refers that by lighting up those shadow zones that the public was deprived of, *Zone*Interdite* honors its potential as a tool do disarm the military force of its censorious power. Zone*Interdite offers a subversive commentary on power structures, the enforcement of control over perception, and on the dissolution of geographical frontiers and barriers through digital technologies.

Strictly political in its data source is Brad Borevitz' *State of the Union* (2007). The project, a work in progress, uses as its dataset the texts of all the *State of the Union Addresses*, from George Washington in 1790 to Barack Obama in 2010, a dataset that at the time of this writing contains 220 documents, 1,669,862 words, and 26,711 unique words. The project shows trends in language of the *State of the Union Addresses,* and the visualizations' shape and content convey a rich and legible impression of each text and its relation to a historical corpus, the issues, crisis, and rhetoric visible across the years (Whitelaw 2007).

The author's aim to render the connection between politics and language visible and understandable to the public, is expressed in the information that is made available through the correlation between the individual addresses and the entire collection. Each *State of the Union address* is visualized as a cloud of words that maps the significant content of the address, its key terms and their relative importance. The horizontal axis shows the average position of every word in the document, while the vertical axis displays the relative frequency, according to the document and the

entire corpus of the addresses data. Whitelaw (2007) states that Borevitz abstracts the obvious rhetoric of every document, neutralizing its iconic language in a process he calls a double movement, from information to data, and back to (prospective) information.

Fig. 119: State of the Union Pres. Barack Obama Jan 25, 2011 (Borevitz 2007).

Borevitz data mines textual objects whose specificity is highly self-conscious, reflected, filled with political intent and instilled with conventions and rhetoric. It abstracts its narrative power and reveals its abstract essence, its power units, exposed, individualized as part of a rhetorical trend.

Carnivore, by Galloway and the *Radical Software Group* (2001), is an open source artist improved version of an FBI sniffing software used in electronic wiretaps and known by its nickname "carnivore". Galloway and the *RSG* made it available to artistic exploration by other artists that created 'client' projects to explore the data "sniffed" by the carnivore server software package. *Carnivore* clones governmental surveillance concepts and technologies of control to offer a poignant commentary

on its very existence and subvert its purpose through artistic and creative exploration.

Fig. 120: Carnivore Logo (Galloway & RSG 2001).

Frieling (2004) states that *Carnivore* demonstrates the political interestingness of pursuing and archiving a net-user's track through data-mining, while Paul (2003) refers that it captures the tension between the Internet's inner data structure and all the visual possibilities that it can generate on the surface. Twenty-four carnivore clients' artworks were made by different artists to interpret the stream of the sniffed data in diverse ways, and thus illustrate the unlimited possibilities of visualizing a server data stream and the relationship between the back end of data and its front end incarnation. Paul also refers to what might be a political statement inherent in the *client-server* relationship of the data metaphor that the carnivore project proposes, and in which the issues of access and control captured by the implications of a *client-server* relationship, are in direct opposition to the *peer-to-peer* promise of liberation from the server and its becoming of a philosophical and political issue.

Sack (2006) refers to *Carnivore* to point out that the reason why the piece is effective is because it draws attention to the fact that the United States Intelligence agencies have the network traffic under surveillance and spy on the general public. To Sack, this instills the fear of being profiled and having one's data copied or doubled, resonating as a fear of loss and of dismemberment of identity that characterizes what Sack identifies as Freud's (1919) *Aesthetics of the Uncanny*. The *Carnivore* project questions the legitimacy of government undercover surveillance techniques, and through its twety-four identified clients, explores the creative visualization of the data streams.

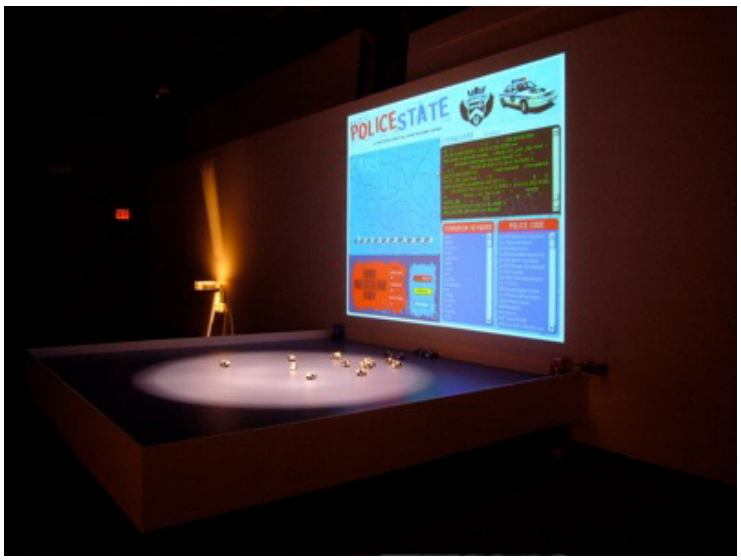

Fig. 121: Police State Installation view (Brucker-Cohen 2003).

Brucker-Cohen's *PoliceState* (2003), one of the *Carnivore* software clients interfaces, visualizes data traffic using 20 radio-controlled miniature police cars simultaneously fed with data that can be taken from a specified network. The software 'looks' for keywords blacklisted as indications of a terrorist attack on American territory and then translates them by *PoliceState*'s software into an actual radio police code, that causes the toy cars to move around in a pattern-like, controlled choreography, while the code's current threat is broadcast through loudspeakers. In *PoliceState;* the piece's name, its operational devices, the little police cars, and even the loudspeaker amplified messages, are all representations of the instances of power and control. Wilson (2010:191) understands *PoliceState* as a critical response happening in the context of the public debate about the FBI's implementation of *Carnivore* to electronically monitor the communications of a large number of American citizens, and highlights the artists' concerns with the loss of privacy and identity that the increase of electronic surveillance implies (Wilson 2010:183).

The Status Project, by Bunting and Brandom (2004), is presented as a database of *Do-It-Yourself* strategies to fulfill the bureaucratic requirements, under UK law, for the possession of official identification—from birth certificates to passports—allowing its users to actually create, dissolve, or merge two different peoples' identities. Bunting (Garret 2010) states that *The Status Project* communicates the fact that in

the UK, people can create a new identity lawfully without consulting any authority, and to illustrate the precise codification of class identities in the UK system, namely: the human being, the person—defined by data traces and artificial identity devices such as cards, and other documentation, and the corporate or artificial person. He adds, that one human being, according to its status, can possess one or more natural persons, and each natural person to control or possess none, one, or more artificial persons such as corporations, in a way that the combined total of natural and artificial persons possessed or controlled by a human being would be thought of as his data body (Garret 2010).

Fig. 122: The Status Project Identity Bag (Bunting & Brandon 2004).

Attesting to the significance of our data body, understood as our trace of data in the data-sphere (Haggerty & Ericson 2000, Stalbaum 2004a) and at the hands of the state and corporations, Bunting cites the *Critical Art Ensemble*'s (1995) assumption that the data body not only claims to have ontological privilege on ourselves, but that in fact it has. They argue that what our data body says about us has become more real than what we say about ourselves, that it is by our data body that we are judged in society, and that it is our data body that dictates our status in the world.

The menace over our electronic bodies at the hands of state and corporations is what *The Status Project* aims to overcome by providing control over our natural person(s)

and subverting the identity game by acknowledging how its codifying works and which means can be used to fabricate new alternative valid identities or to camouflage our data body by "dataflagging" our existence.

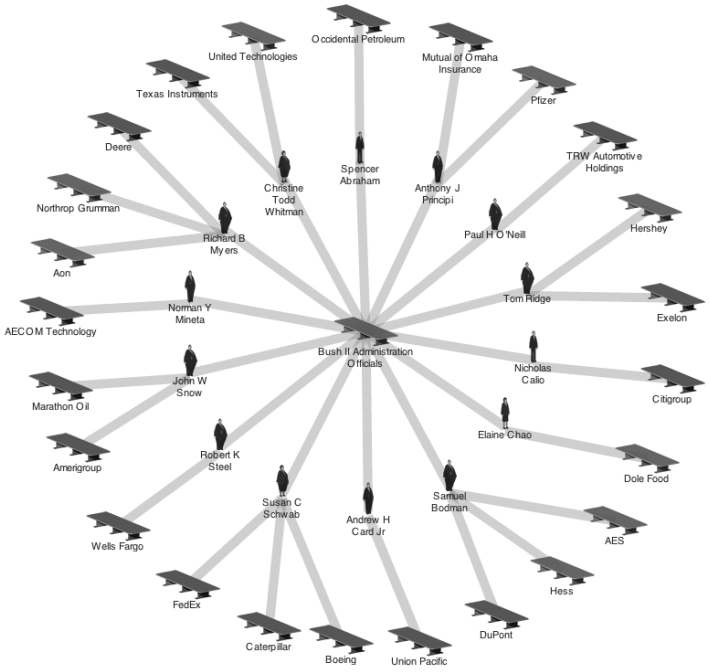

Fig. 123: They Rule Bush Administration (On & Futurefarmers 2001).

Josh On and Futurefarmers' *They Rule* (2001) is addressed in order to approach the political aspects of data knitting, as well as to visualize an assemblage of notions pertaining to networks, corporations, power, and activism (Brouwer, Mulder and Charlton 2003). The piece is presented as a launchpad to investigate corporate power relationships in the United States, by allowing users to browse through a constellation of the most powerful companies in the world, explore relationships between their power structures as they are expressed in the interconnections between their board of directors, and witness that some of the actors sit on 5, 6 or 7 of the top 500 companies, and simultaneously on government committees, universities, think-tanks, foundations, and other elite institutions, ruling and making decisions that affect our lives (On & Futurefarmers 2001).

They Rule is presented as fulfilling the promise of the Internet as a democratizing medium by subverting its other characteristics as a place where our bodies are data

mined for purposes of control, and commodified as consumers. *They Rule* gives us the Internet as a place from which the data necessary to reveal the connections of these and other power structures can be easily retrieved and operationalized into information, knowledge and insight. Sack (2006) refers to the project as an example of a visualization of the *Body Politic*—the organized collective—in a mediated space, as a way to see both the *demos* and the tyrants that we can easily see and feel in the physical context of, for instance, a crowd. He suggests that discovering or inventing a visual form to show the *Body Politic* itself to itself, for example as in social software contexts and environments, is the outstanding problem of artistic research and information visualization, and that we, as part of a larger *Body Politic* in democratic society, need to see ourselves and our imagined communities within our larger political and cultural contexts (Sack 2006).

Cheryl L'Hirondelle Waynohtêw's *TreatyCard version 2* (2002-2004) plays on the politics of race and the complex issues that Canada faces concerning its postcolonial relations between First Nations native peoples and other Canadians (Gates 2003). The 'Treaty Card', a government 'Certificate of Indian Status', has the purpose of tracking the movement—spending patterns, prescription drug use, doctor and dentist care, police contact, Social Services use—and institutionalize the identity of Indians within the meaning of the Indian act. Waynohtêw's *version 2* subverts this mechanism of political control by allowing anyone to log onto its website and create a new or alternate version of their card, which better reflects their relationship with the land and state.

Graham Harwood's (Mongrel) *Lungs-london.pl* (2004) is a perl script that rewrites William Blake's 1792 poem *London* into a Perl software-code poem that includes commands linking disparate databases of facts relating to atrocities (wars, child health indexes, life expectancy, average lung capacity), and computes their statistics as the basis for a sound-based performance for the Thames Estuary. The resulting poem-code software assemblage takes the statistical data as variables to compute the volume, length, and number of breaths of an aggregated set of lungs—and their lost capacity, that is then pushed through the speaker system in the waveform of a scream (Harwood & Mongrel 2004).

The referred Srebrenica example performance, taking place in Amsterdam, takes statistical data—ages, names, heights—from the International Committee of the Red Cross report to estimate that 8000 Bosnian Muslims were killed by Bosnian Serb forces, and calculates the total aggregated lost lung capacity of their last breaths—29200 litres of air, that were then to be pushed through the speaker system— ideally placed in the vicinity of the atrocity or contextually related area, and with the sound radiating up to one mile from the source—as a scream.

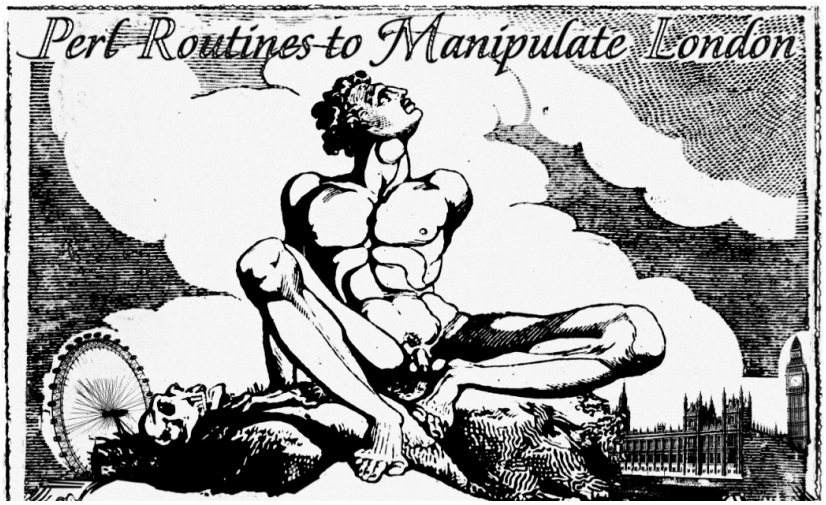

Fig. 124: Lungs-london.pl (Harwood & Mongrel 2004).

Lungs-london.pl is data sonification—data turn into audio or non-speech sound in order to be perceptualized (Kramer ed. 1994). Harwood and Mongrel's *Lungs: Slave Labour* (2005) is another instance of the Lungs project but using a different database. The working concept is the same, but the acoustic visualization—sonification—is now based on Nazi records of the foreign laborers that were forced to work in the ex-munitions factory that now houses the *Centre for Media Art* in Karlsruhe. Wright (2008:85) argues that the project attempts to give a database a pair of lungs that reconnects people with the acts of political atrocity in a very visceral way, and, in the process, contradicting the muteness of the bureaucratic records themselves, factually elaborating the politics involved in any representation of data.

Wright (2008:86) further elaborates on *Lungs* as a model for visualization to reach its full potential, both as scientific and artistic technique, pointing it out as an example of the software ability to put cognitive and affective modes of perception into cre-

ative tension with data structures and with each other, and in that way, articulating the gap between data processing, social life, and sensory experience.

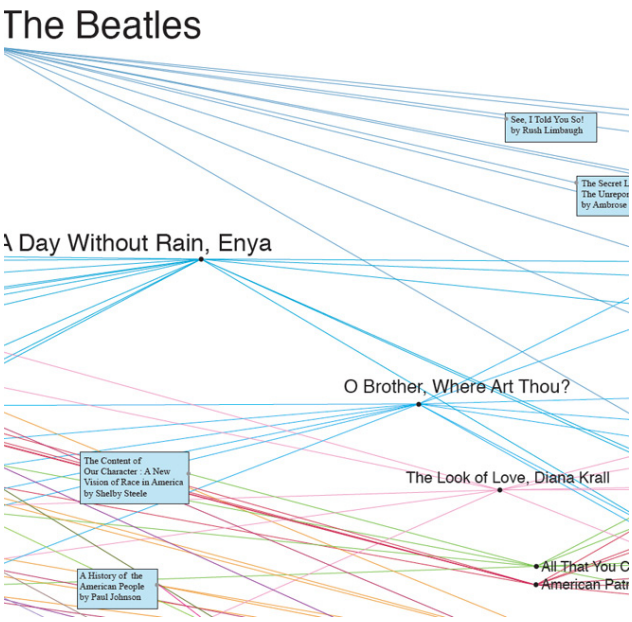

Fig. 125: Data Mining the Amazon (Waller 2002).

Data Mining the Amazon, by Waller (2002), explores the database of the online bookstore *Amazon.com,* filtering and mining the data collected on its users' profiles and mapping musical tastes against political poles, according to users' choices in shopping products. Groups of users literary buying trends of political texts, ranging from the far right to the far left of the political spectrum, had their musical taste correlations mapped to such a point, that it is referred based on the data that the readers of Margaret Thatcher's biography tend towards opera, while Microsoft employees listen to Nelly Furtado.

Waller's project attests to the massive data-flood that corporations are harvesting with the aid of electronic technology and the overall computerization of business transaction roles in profiling their clients as consumers. The analysis (or data mining) of this data is what provides the companies with information to predict and map users' trends, that in the specific case of *Amazon* allows the company to make purchase recommendations to their customers. Waller's project puts this tactic in a political context, and questions the way these media and commercial trends dissem-

inate from these global outlets into public opinion (Cook, Dietz and Kiendl 2004). Waller states that Pierre Bourdieu (1984) concluded that the way we classify things (operas, desserts, leisure activities) is inextricably tied up with the way we classify ourselves and others as social beings, and that *Data Mining the Amazon,* borrows this philosophy by re-appropriating marketing recommendation strategies to draw conclusions about political beliefs and aesthetic judgements (Waller & Brucker-Cohen 2003).

Although the history of people's constitution as abstracted, surveilled and controlled data entities is quite long, some of the dynamics of its collection, and the data typologies involved—for example, personal location data automatically gathered by mobile devices—are novel and powerful. Jer Thorp (2011) argues that we are existing in a world where the data about us is being collected on a massive scale, and currently being stored, analyzed and monetized by corporations, with little or no agency for the people to whom the data is supposed to belong. Projects in the Political and Societal realms of data exploration offer commentaries that attest to this problem, and attempt to provide frameworks—social, political, intellectual or technological—for people to regain sovereignty and agency over the collection, storage, and manipulation of data about themselves.

Transcendental

The Transcendental aspect of exploration is directly related to an aspiration to transcend the expected, the traditional and accepted paradigms that the bringing of matters to a head implies (Fallman & Stolterman 2010:269). Testing ideas, provoking, criticizing, and experimenting in order to reveal alternatives, by asking "What if?" questions are among the approaches that concern transcendence (ibid.). Fallman (2008:7) draws transcendence from Ehn (1988) that refers to it as the exploration of possibilities outside the current paradigms—whether these are paradigms of style, use, technology, or economical boundaries.

The transcendence of current paradigms through exploration is also tightly connected to its seeking of the possible—as an alternative to the true, or the real—and, consequently, to show an alternative future. Fallman (2008:13) explores transcen-

dence in the tension regarding tradition by illustrating that the traditional way is rooted in the extension and improvement of already established products or ways of working and thinking, while the exploration of possible futures takes place by transcending—breaking down and going beyond—the boundaries of an existing design paradigm, often by problematizing, criticizing the established, and through provocation tactics.

Fig. 126: The Wreck of Hope (Friedrich 1823-24).

The figure of the explorer is one of transcendence and search for sublimity. As previously referred, Lisa Jevbratt (2004a) makes use of Caspar David Friedrich's *The Polar Sea* painting, portraying a shipwreck that is also known as *The Wreck of Hope* in reference to an early *North Pole Expedition*, to illustrate a classic romantic idea of the sublime. The painting portraying the rough forces of nature evokes the inhospitable and the explorers' will to reach the unreachable and do the impossible, the attraction for the void.

We bring back Jevbratt's argument that the datasets and sensations we have to deal with are of no less dimension, vastness and grandeur than the ones that were the subject of the classical sublime and romantic artists had to face. She makes the case for aesthetic decision-making—when facing highly complex systems and the impossibility of making "rational" decisions within them, we understand them by making more intuitive "esthetic decisions" (Burnham 1968)—and parallels it with

Kant's reasoning about the mobilizing effect of the sublime that must have inspired every romantic explorer to roam the earth's most inhospitable corners.

Jevbratt refers to Kant's claim that in experiencing the sublime, as when facing large amounts of information, huge distances and ungraspable quantities, rather than feeling overwhelmed, we feel empowered and capable, our senses and organizing abilities mobilized. Kant's overwhelming sublime as an activating sensation in which the huge and the ungraspable can motivate intuitive understandings of the data points to a an approach to data exploration that transcends the discourse of utility in visualization toward breakthrough discovery or the play of poetics and insight (Diamond 2010).

Live Wire, by Jeremijenko (1995), transcends by visualizing network traffic through a dangling string sculpture. The piece, an eight feet dangling plastic wire attached to an electrical motor connected to an ethernet transceiver that moves proportionally to the number of packets transmitted through the network, poses as a shared social display of information through the peripheral representation of the network activity in the dynamic behavior of a simple plastic wire.

The Live Wire's contribution for the future of technology is expressed in Weiser & Brown's (1995) characterization of the unobtrusive presence of the piece as meeting a key challenge in technology design for the next decade of how to create what they designate as calm technology. To Weiser & Brown, *Live Wire* is a radically new tool that shows the ordinarily invisible bits flowing through the wires of a computer network, through motion, sound, and even touch, adding that it communicates both light and heavy network traffic and its output is so beautifully integrated with human information processing that one does not need to be looking at it or near it to take advantage of its peripheral clues.

Weiser & Brown's notion of "calm technology" is tightly connected to their idea of "periphery"—used to name what we are attuned-to without attending-to explicitly. Live Wire's elegance and calm technology instance relates, according to Weiser & Brown, to the way the piece creates a new center of attention through its uniqueness, that soon becomes peripheral as the gentle waving of the string moves easily into the

background, and the fact that it can be both seen and heard helps by increasing the clues for peripheral attunement.

Jeremijenko (1997) underlines the piece's transcendence and subversion of the norm by stating that the piece is intended to be a peripheral material manifestation of cyberspace, out of the users' face, and sharing its physical space as tacit information rather than more of the precisely graphed, data fetishism of information rhetoric. Vande Moere (2005), whose discourse on information visualization is primarily concerned with aesthetic considerations and dissonant with its most utilitarian rhetoric, suggests *Live Wire* as the precursor and earliest example of (electronic) ambient visualization—in its physical and socially shared location, the piece turns data flux into motion materiality through an act of energy transduction.

Jeremijenko's piece not only breaks conventions by transcending visualization paradigms, but also opens new paths confirming new conceptual approaches to the future of technology, considering its ubiquity and the way it relates to our physical, cognitive, and perceptual spaces.

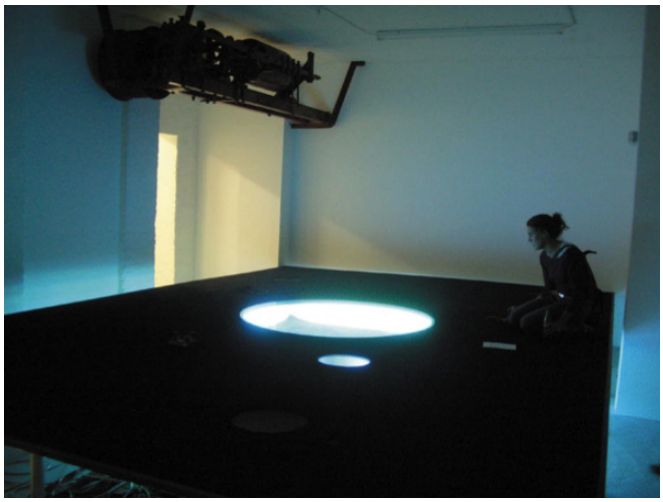

Fig. 127: Zgodlocator Installation view I (Weiser 1998-2002).

Herwig Weiser's *Zgodlocator* (1998-2002) is a slightly different "animal", not immediately concerned in the visualization of information, although also exploring notions of tangibility and transmaterial interconnections. In its conjunction of hardware, noise, transformation, magnetism, and analog data, *Zgodlocator* is a pure

act of transcendence. Weiser's piece makes use of hundreds of computer hard disks whose 'data' was literally triturated into a magnetically sensitive grit that users can manipulate by a number of buttons to produce strong magnetic fields that turn the grit into freakish landscapes, patterns and noise.

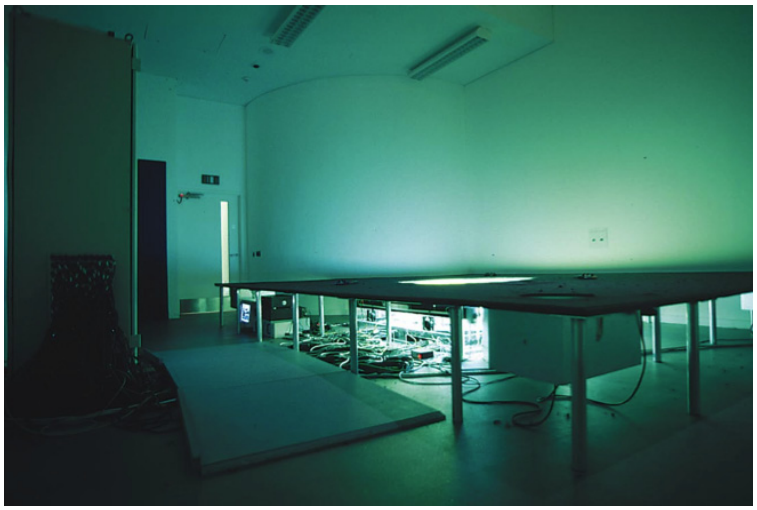

Fig. 128: Zgodlocator Installation view II (Weiser 1998-2002).

Brouwer, Mulder and Charlton (2003:47) attest to the piece's stressing on the continuous reprocessing of information and the reconstruction of constantly changing dynamic archives by proposing magnetism as the dynamic container that in *Zgodlocator* stores, manipulates, and processes information in its most raw and plastic form, that is, matter. *Zgodlocator*'s transcendence resides in the transformation of actual data by grinding its containers into the raw data of the piece. If the data in the hard drives are operationalized by the computer and its users' cognition into information, the raw data is operationalized by energy and its users into a physical sensory experience through transcendence.

If, as Paul affirms (2007:181), search engines and browsers are still the conventional ways of mapping and filtering the network's information, projects such as *I/O/D*'s *Web Stalker,* Maciej Wisniewski's *netomat™,* and Mark Napier's *Riot* are a subversion of those conventions as examples of alternative browsers that allow the user to experience the Internet in a way that challenges the way information is structured in preconfigured and corporate portals.

I/O/D 4: The Web Stalker, by *I/O/D*'s Fuller, Green and Pope (1998) is a browser developed by a team of programmers and artists; a mechanism that can be used to investigate the structural depths of the Web sitting between technological developments and art (Helfert nd); as Browser art—a new sub-genre of Internet Art that is mapping the Internet in its own way, and on its own established the 'medium' of alternative browsers; revealing the Internet's "database architecture" as aesthetic form by exposing its internal structure (Paul 2002, 2007); as an alternative Web browser that does not display the Web Pages as commonly expected but rather visualizes the underlying HTML structure of the Web presenting the code in a highly aesthetic manner as delicate lines that erupt on the page to form stars of connected nodes in a web (Bosma 2004); as a carnivorous browsing application and as a software art predecessor of other artist tweaked and twisted tools to surf the Web (Galloway 1999); as showing us the backstage of browsers (Lovink 1998); and as 'speculative software' in the sense that it tries to uncover hidden aspects of the Web and promote other potential cultures for its use beyond the aesthetic conventions of commercial browsers, as well as developing a different relationship to beauty (Fuller in Lovink 1998).

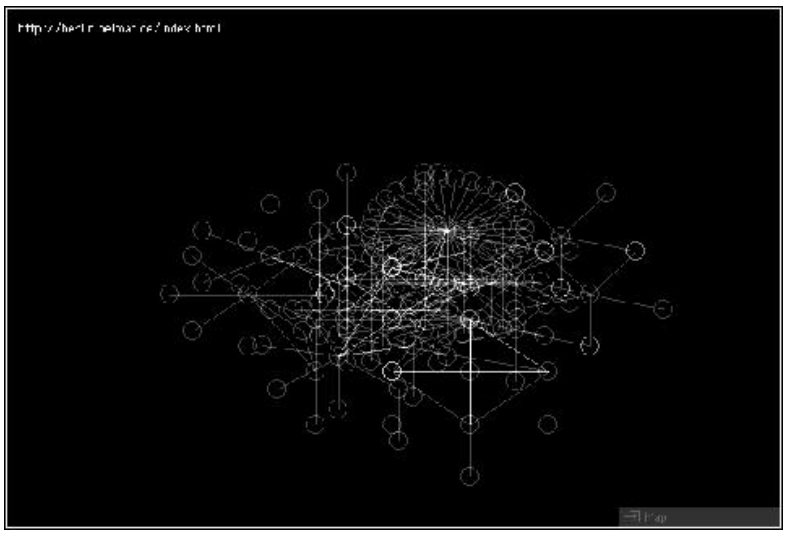

Fig. 129: The Web Stalker (I/O/D 1998).

Wisniewski's *netomat*™ (1999) was originally conceived as a network-based art project, and as an open free-form and flexible alternative to traditional page-based HTML browsers and search engines. Wisniewski's piece responds to text typed in by the viewer to retrieve text, images, and audio that is flown freely by the software

onto to the screen, using a new audio-visual language designed specifically to explore the unexplored Internet. In Paul's opinion (2001) *netomat*™ rewrites browser conventions by extrapolating off of the browser window and presents the web as an infinite data scape and data space.

Closing the alternative browsers' collection, *Riot,* by Mark Napier (1999), is also described as an alternative, "cross-content" Web browser that like its real-world namesake, disrupts the accepted rules of property and exposes the fragility of territorial boundaries on the Web. The software acts as a blender that mixes webpages from separate dissonant domains into a browser window, to the point of being referred to as a software "melting pot" by combining contents from opposite poles of the Web such as, for instance, the official *Vatican Website* with *Hell.com* or *Microsoft.com* with the hacker quarterly *2600.org.*

Fig. 130: Riot (Napier 1999).

Riot transcends browser conventions by clashing and merging contents and ideologies, dissolving territorial conventions and creating a composite based on a form of controlled randomness that is part user input and part the artist's parameters. As a semi-random content mixer, *Riot* is presented as questioning the assumption that "content is king" by undermining and separating content, treating it as raw material or data for its aesthetic experiments, and rewriting the rules of ownership and terri-

tory that the browser imposes, by accessing the underlying code of Web pages and displaying those pages in his own format (Napier 2001).

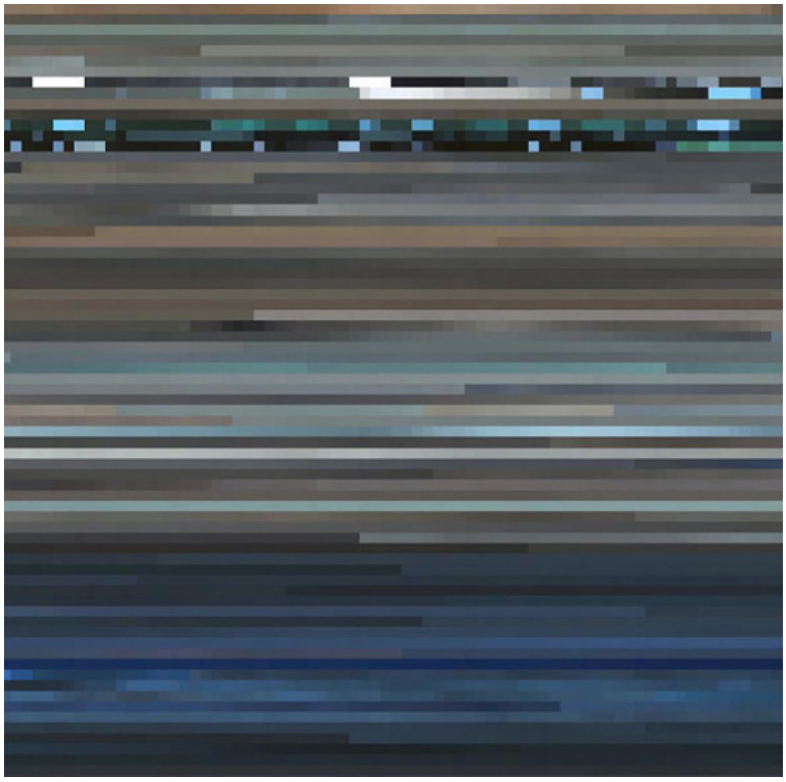

Fig. 131: The Top Grossing Film of All Time, 1x1 (Salavon 2000).

In Whitelaw's words, Jason Salavon's work uses overdetermined content as source material—such as the too familiar, the most highly produced, the most redundant and banal, and even abject, and ultimately empty, mass of generic content—to, in a deadpan generative strategy, operate its transcendence and through its abstraction extract aesthetic pleasure from the mundane. And the referred mundane source data or "underlying real" in Salavon's pieces are: in *Top Grossing Film of All Time, 1x1* (2000), James Cameron's *Titanic,* digitized from video in its entirety and broken up into its constituent frames, which were then averaged to a single color and reformatted as a photograph mirroring the narrative sequence of the film in a manner that is the film's narrative visual rhythm can be read as laid out in pure color. Or in *Everything All At Once* (2001); and *Everything All At Once (Part III)* (2005), the input of television signal converted in real-time to average color streams of abstract images.

Salavon's *Portrait (Rembrandt)* (2009), the final installment of a broader series, begun in 1997, works at a totally different level of transcendence. It is made of a series of pictures that employ the bulk of the portrait oeuvres of Franz Hals, Rembrandt, van Dyck, and Velázquez, and in which a simple algorithmic mean-averaging of high-quality reproductions of the paintings yield what the author calls an atmospheric meta-portrait.

This time, the source data is not the banal and the mundane but quite the opposite—the prodigious and the masterful. Nevertheless, the resulting amalgamation of all of Rembrandt's portrait oeuvre, through mathematical mean-averaging, in a single, almost impossible ghost-like image, is overwhelmingly sublime and a work of transcendence.

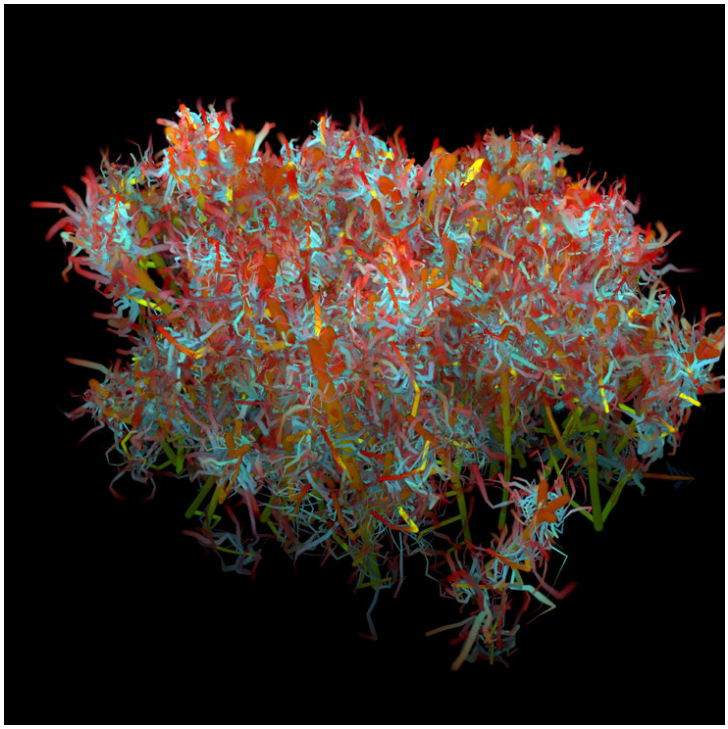

Fig. 132: Spam Plants (Dragulescu 2006).

Alex Dragulescu's transcendence of junk mail source data into architectural form in the *Spam Architecture* series (2005), and into lush vegetation in *Spam Plants* (2006), illustrates an approach to data exploration away from producing new insights into reality, in turn reflecting its self contained abstraction and malleability into acts

of pure expression (Whitelaw 2007). *Spam Architecture*'s uncanny constructions or *Spam Plants*' organomorphic, multicolored, and translucent forms have their ontology in what Whitelaw designates as "abject data", and points out that in the digital realm, the process of mapping something into something else is an open way to a state of polymorphism where anything can be anything.

Discussing Dragulescu's distancing approach from a content clarification of the data that is normally the object of scientific data visualization, Watz (2006) refers that the viewer, freed from any clues for rational evaluation of the nature of the mapping and from any author claim's to produce literal meaning, can simply enjoy the output as a complex formal experiment in which spam, abject unwanted data and a source of irritation, is transcended into intriguing objects of great beauty.

Fig. 133: The Idea of a Tree Rendered Object (Mischer'Traxler 2008).

The Idea of a Tree, by Mischer'Traxler (2008), transcends artificial fabrication by bringing it closer to a natural process. The piece is a solar fabricator that translates sunlight's luminosity into a string and epoxy shape with variable density according to the subtle daylight variations. It literally grows an object that is a direct recording of a particular place's light specificity, transformed into energy and then reflected upon the very object's morphology. The project bridges machinery and nature together. It starts from the notion of a tree as a product of its specific time and place

to bring its recording qualities and its dependence on natural cycles into artificial products.

In the same way as trees are living organic records of their own context and surroundings, the machine weaves a subtle environmental recording that is the size of a day-long energy flow. It starts at dawn and stops when the sun sets at the end of the day, offering an object that is ready to be harvested. *The Idea of a Tree* transcends fabrication paradigms by creating a platform that allows natural light to present itself as an alternative source of energy and aesthetic expression, and in this way the piece is as much an idea of a tree as it is an idea of a sustainable future infused with transcendental beauty.

Financial or stock market data can also be the object of transcendence through data exploration. Paul (2007:99-100) refers to John Klima's *ecosystm* (2000), and Lynn Hershman's *Synthia* (2000), among others, as different ways to visualize a similar dataset, each project creating its own contextual framework to perceive the data flux and dynamically map the real-time data stream.

If Martin Wattenberg's *Map of the Market* (1998) albeit proposing an innovative use of a variant of the "treemap" technique pioneered by Ben Schneiderman and by now the standard tool for visualizing financial data, still holds ground for an useful information-driven approach to data visualization, Klima's and Hershman's projects transcend its data sources into various degrees of aesthetical digression.

ecosystm is a real-time representation that uses as its source material a conjunction of global currency volatility fluctuations, leading global market indexes and up-to-the-minute weather report data from *JFK* airport, into a 3D environmental simulation that users can explore. The piece portrays flocks of "birds" as country's currencies and branching "trees" as country's leading market indexes that grow and decline according to index or currency fluctuations, live and behave according to an available space variable that is correlated against the average of daily currency and yearly volatility.

This simulated world infused of aesthetic expression mirrors the financial market at work, appearing either as a serene and beautiful world experienced from a majestically gliding bird, or as an aggressive and eerily threatening environment, depending on the world's currency fluctuation performance (Paul 2007:183-184).

Klima's piece transcends what could be a purely functional representation of the financial world into a highly expressive one that mimics and simulates its behavior. His piece illustrates the systemic codependence in the financial market and gives an idea of its general mood at a first glance at the environment. As a radically different approach from typical models that represent market information through quantitative expression, *ecosystm* untangles the market relational complexity into a world in which getting a feeling of the market is as straightforward as looking out of the window to see whether it's raining or sunlit.

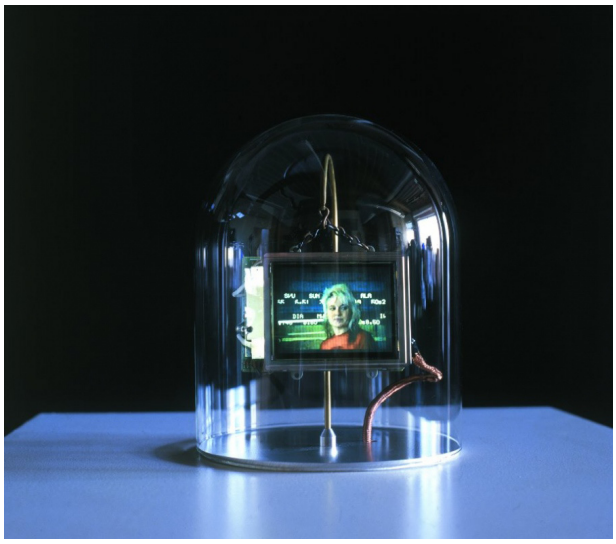

Fig. 134: Synthia (Hershman 2000).

Hershman's *Synthia* (2000) is also engaged in the financial market's behavior expression through a connection to a virtual character whose behavior is triggered by the most recent information on stock prices. Presented as a symbol of the symbiotic relationship between people and the market, *Synthia*'s mood acts according to the atmosphere at the stock exchange, she dances if prices go up or sits anxiously at her desk if they go down.

Hansen and Rubin's *Listening Post* (2002-2005), also referred in the societal section in relation to its working context and source data materials, provides an experience of online communication that its deeply aesthetical and pure transcendence. The project woks as an installation that extracts text in real time from thousands of Internet chat rooms, bulletin boards and other public forums, that then parses, sorts, analyses, and vocalizes through a voice synthesizer, and simultaneously displays across a suspended grid of 231 vacuum-fluorescent screens. The piece cycles through six different movements that output different arrangements of visual, aural, and musical elements as a visual and sonic response to the content, magnitude, and immediacy of virtual communication, leading Kasprzak (2005) to call it a monument to the present by its sound of 100.000 people chanting, and an attempt to grasp the overwhelming totality of online chat sound, synthesized into a poetic artwork that would also be faithful to its data source (Rubin 2010).

Fig. 135: Listening Post detail (Hansen & Rubin 2002-2005).

Redler (2008) refers to it as a 'dynamic portrait' of online communication that allows its viewers to experience an extraordinary snapshot of the Internet and gain a great sense of humanity behind the data, as well as a monument to the ways said humanity finds to connect with one another and express their identities online. Huhtamo (2004) states that people described their experience of *Listening Post* in near-religious terms as meditative, sublime, elevating, hypnotic and captivating, adding that while experiencing the piece's installation it is easy to forget the passage of time and the surroundings, being lulled into a trance-like state of immersion that goes beyond interactivity into an experience of the database that its purely aesthetical.

The capture of wholeness through surprising and tantalizing images and processes is also generally present in Ben Fry's work and with outstanding simplicity in *All Streets* (2008). The piece represents all the streets in the lower 48 United States in a unique image with 26 million individual road segments. Although no other features such as outlines or geographic features have been added to the image, they still emerge, as roads steer clear of mountains, and sparse areas convey low population, turning *All Streets* in a structural map whose shape is rendered by every channel navigating the territory, a vascular depiction of artificial nature with different densities and intrinsic beauty. Fry (2008) states that while there is nothing particularly "genius" about the piece, being mostly a matter of collecting the data and creating the image, it is still one of those cases where even in a (relatively) raw format, the data itself is quite striking.

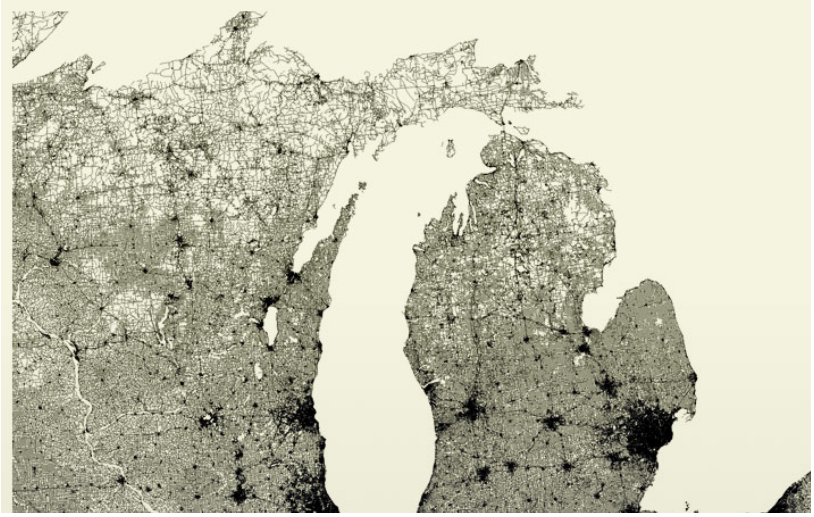

Fig. 136: All Streets detail (Fry 2008).

All Streets is evidence to the way in which all the streets in a territory give a vivid representation of a nation's geography with impressive detail. It is also remarkable how the country's nature is revealed by its artificial morphing, and the fact that the piece almost stands as a direct account of the end of the unknown in a specific territory, where all is travelled and that less is left to be explored or discovered.

Finally, the piece that Liu (2004:13) refers to as a classical work of net art and perhaps the epitome of the data sublime. Lisa Jevratt's and C5 *1:1,* includes the creation, maintenance and visualization of a database containing the IP addresses to all hosts

on the World Wide Web, that is also used to create interfaces for navigating the web, and to generate its new topography (Jevbratt 2004a).

Fig. 137: 1:1 at Database Imaginary, Banff 2004 (Jevbratt & C5 1999-2002).

Whitelaw (2007) refers to *1:1* as a straightforward and transparent mapping of a dataset to an image in which rather than operating the transformation of data into information it directly converts one form of data into another—symbolic into visual. Frieling (2004) states that *1:1* pursues the aim of being able to illustrate the "entire" Internet's "Big Picture" in a high-resolution image, and by Paul (2008:182) as a way of collapsing the distinction between map and interface, the interface becoming a *1:1* representation of the environment it portrays.

Migration (2002-2005), a different interface to *1:1,* and *Infome Imager Lite* (2002-2005), in which the transparency of *1:1* is pushed a step further turning over the data gathering and visualization process to the work's audience and offering a platform for in-depth experimentation, exploration and visualization (Whitelaw 2007) are closely related to *1:1* and on the same frame of mind.

Although presenting us as visual texture abstractions, Jevbratt (2005) argues that those projects' visualizations are realistic in their direct correlation to the reality

they are mapping: the *1:1* in the piece's title means a one-to-one correlation between each visual element and what they represent—a website IP address—, their position, color, and shape corresponding to graspable functions, constituting the images as real objects for interpretation that can be experienced, that let the complexity and information in the data itself to emerge in front of the audiences' eyes.

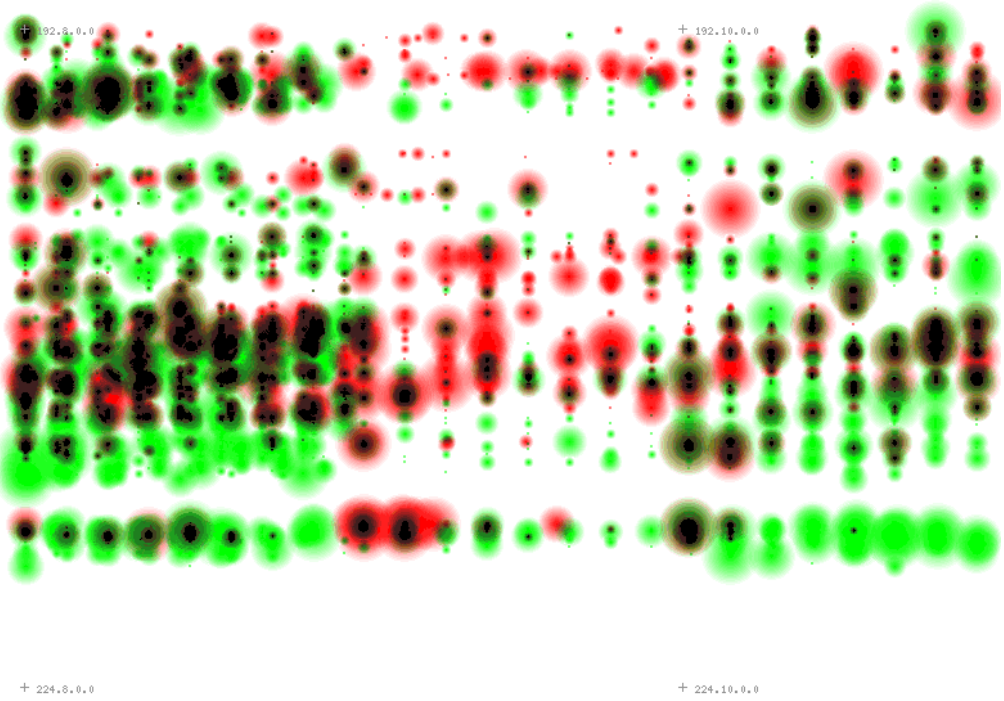

Fig. 138: 1:1(2) Migration (Jevbratt 2002-2005).

Jevbratt (2004a) argues that the datasets that we now try to unravel—through computation analysis or visualization—and that comprise all sorts of data, whether generated from looking in and down at us, or at the earth and our technologies, are of no less dimension, vastness and grandeur, and as substantial, complex and ungraspable, as the "datasets" that were the subject of the classical sublime—the impressions and sensations of nature and the far universe that posed themselves to explorers, romantic artists, writers and philosophers. Nevertheless, she argues that while in the original romantic sublime the force operating in us was attraction (in which the divide between us and nature urged us to go there, far away to reach it

in order to know), now in what she terms the inverted sublime, and with our post-structuralist acknowledgment that we are always part of the system we are looking at, the force at play is one of repulsion, of methodological distancing from our hypothetical familiarity with our subjects.

Jevbratt (ibid) poses the question of why are we trying to find methods to allow the sublime to operate and what those methods should be, and makes the case for Burnham's and Galbraith's proposition for the effectiveness of more intuitive esthetic decision-making when concerning the understanding of complex systems, paralleled with Kant's reasoning about the empowering mobilizing effect that the ungraspable and overwhelming sublime has in our organizational abilities, and that to Jevbratt, allows people, in the right circumstances, drawing on sensations of the sublime, to make intuitive understandings of the data.

Jevbratt's case is then one for information rich contexts, where more is better, and where the piece operates transcendence of the content and transcendence on the viewer. She argues that the most common mistake in data visualizations is not too much information but too little and too compressed, and that their "images" of the data landscape are not high resolution enough for an intuitive aesthetic decision to be made and make sense of the data.

Aesthetical

Jevbratt is not alone when she appeals to the creation of a setting that allows for aesthetic decision-making in complex systems as a path to understanding. Fallman (2008:8), drawing on Manovich (2002) and Richard Coyne (1995), states that design exploration creates the necessary space for the acknowledgement of aesthetical issues by the interaction design researcher. He expresses the belief that aesthetics, while suppressed by the discourse of functionalism for decades, is a central concern for the field, relating to issues of beauty, harmony, and fitting in the digital world; as well as complex issues relating to the creation of users' experience, such as representations, sense perception, experience, conformance, and infringement to tradition and culture, materiality, and genre.

Fallman (ibid.) also points out that the aesthetic issues concerning interaction do not only relate to how something looks and feels, but also the wholeness in interaction that includes how something works, how elegantly is done, how well interaction flows and the content fits in. This aspects led him to argue that design exploration is the activity area that creates working contexts dealing with wholes—with complete dynamic gestalts. We believe that characteristic is particularly important when considering projects that provide immersive interactive experiences of the datasets to its users.

Manovich (2001) commenting on the appropriateness of modeling an endless and unstructured world of images, texts, and other data records, as a database, argues that it is also convenient to develop a poetic, ethic, and aesthetic of that database. Cawthon & Vande Moere (2007) argue for organic qualities in data visualization, such as growth and expansion, as a perception of high level of aesthetics and encourage its incorporation as a whole, along with aesthetics, in both their visualization techniques' conception and evaluation. They argue that aesthetics should no longer be regarded as a cost to utility and that it rather has a positive role and purpose in the design of data visualization techniques.

Lau & Vande Moere (2007) speak of information aesthetics as a visualization field that closely merges aspects of aesthetics, data and interaction, as well as forming a cross-disciplinary link between information visualization focus on data, and visualization art's focus on aesthetics. They present their model's uniqueness in its focus on aesthetics as the degree of artistic influence on the mapping technique of a specific visualization, and the aesthetic engagement it affords, as opposed to aesthetics as a measure of subjective appeal.

Vesna (2000) argues that, historically, artists have long realized the aesthetic and conceptual potential of databases, and have developed work deliberately using archives and databases in its practices, sometimes as political and social ready-made commentaries. She points out that their aesthetical endeavors have gone beyond visual representation into the invisible aspects that relate to the organization, access, extraction and navigation of information, as well as making use of the data as raw material to investigate and actively comment on the context in which they operated.

Dietz (2007) also refers to an aesthetic of operativeness, pointing out database use by contemporary artists as a medium and as an aesthetic platform for their concepts, rather than merely as a container of data. Paul (2007) argues that the imposition of the logic of the database to any type of information, using principles such as filtering, mining, analysis, and visualization, brings forward to the digital art discourse the term database aesthetics. She adds that it is inherently a relational aesthetic that poses as a conceptual potential and cultural form, for its promise to reveal visually, the patterns of knowledge, beliefs and social behavior, as well as offering possibilities of tracing processes of multiple kinds, be they individual, cultural, or communicative.

To Sack (2006), the critical and artistic value of works in information visualization is the essential issue to be formulated by an aesthetic of information visualization undertaken as an artistic research practice. He states that the field's commitment to visual form, appeals to aesthetics as a field of inquiry in its role in examining issues of sensation and perception, and the understanding of why something is, or is regarded by someone as, emotionally and sensually moving, or beautiful, ugly, awe-inspiring, emotionally overwhelming, scary or comforting.

Diamond (2010) argues that data visualization aesthetic practices, and its potential for providing visual pleasure while offering the possibilities of insight, understanding, and knowledge extraction on specific data contexts, draw from art, design, computer and information science, and the sciences in general. As an artist working form within the field, Diamond offers a characterization of artists' data visualizations as enhancing the visual literacy of the field, namely through their precociousness with language and context, their tendency to cross-disciplinary collaborations and thorough training in aesthetics.

Taking into account the diversity of the considerations regarding aesthetics and aesthetic principles, involved in database-related practices, it is hard to point out a specific project from our data collection that doesn't reveal any level of aesthetic consideration, if not from the fact that all of them derive primarily from artistic contexts and artistic approaches to the database. Nevertheless, some projects tend

to demonstrate a more thorough exploration of aesthetical engagement or aesthetical principles than others, as they evade the discourse on utility, clarity, precision, efficiency and functionality; opting for expression, immersion, sensation, and affective experience, or sometimes away from information, and into transcendence. Of course the presented characteristics are not mutually exclusive and some projects manage to operate an effective balance between them. It is also possible to speak of an aesthetic of transcendence and that the projects referred as transcending or transcendental could be easily categorized under aesthetics, whether by pursuing beauty, sublimity, or the uncanny.

Diamond (2010) refers to art and literature's definition of the sublime—whether in nature or immense artificial systems—as the threatening, unknown, ungraspable and beyond understanding, adding that sublime imagery seeks transcendence by elevating the mundane everyday to godliness.

On her discussion of beauty and utility in data visualization, Diamond refers that Ben Fry's projects double as utilities that enable scientific investigation and artworks. She quotes studies in human computer interaction by Tractinsky, Katz and Ikar (2000) that demonstrate that users pay greater attention to beautiful images and that usability and beauty are viable companions.

Valence is contextualized as a dynamic counterpoint to static data representation methods, as well as a paradigm of dynamic representation of large datasets into a field of scientific and aesthetic research. The project is a polyvalent artifact that is able to visualize and compare almost any data source. Its resulting visualization is described as responding to new data by changing over time, and as furnishing a qualitative feel for the perturbations in the data that builds a self-evolving map driven by patterns.

Genome Valence, an instance of *Valence* presented at *The Whitney Biennial* (2002), visualizes the biological data used to compare the genomes of the human, fruit-fly and mouse. Fry mentions that the premise to better understand large bodies of information is to enable a feel for general trends and anomalies in the data by providing a qualitative slice of the information's structure. Paul (2007:178) states that

Valence is presented as an aesthetic "context provider" that sets up, less obvious, subterranean or imperceptible relationships between data elements.

Fig. 139: Genome Valence (Fry 2002).

Wilson (2010:184) commenting on *Valence,* suggests that it is the role of artists to help addressing the challenge of how to make use of the data that results from the capture of every corner of life in databases, as well as how to think about its negative aspects and its dangers, and even more important, indicating ways to move beyond utility, transforming data-derived information into novel aesthetic forms. Stalbaum (2004a) refers to Paul's (2007:178) description of *Valence* as clearly highlighting the notion of beauty, revealing form and making cognizable, as the goal of data visualization art works that deal with large datasets.

Perpetual Storytelling Apparatus by Julius von Bismarck and Benjamin Maus (2009) is a data-driven storyteller. The machine draws a continuum of plotted patent art

by correlating keyword text from bestselling novels with a database of several million patent drawings and cross-references from *United States Patent and Trademark Office.*

Fig. 140: Perpetual Storytelling Apparatus (von Bismarck & Maus 2009).

The plotting storyteller device establishes a poetic and aesthetic dialogue between the parsed text from the novels and the stream of illustrations detailing a never ending array of technical descriptions. As the original input data is stripped from its overall context, preserving only its chronology, so are the extracted illustration figures, whose original frame of reference looses ground considering the creation of this new weaved stream of visual imagery. The storytelling device operates an act of translation starting from the individual written imaginary into the collective bank of human illustrated inventiveness.

Smith (2010) refers that von Bismarck & Maus make use of the patents as a reflection of the mindset of society in a certain time in history, stating that a strange tension between the patent documentation and the actual history and social culture of technology is at the heart of their drawing machine. Beyond the patent art entanglement with history and the processual ethos imbued in the piece, what surfaces is an expression of intrinsic beauty in the illustration patterns weaved by the plotting machine.

100.000 Streets, by Geert Mul (2002), explores the visual overlap of cities all over the world by presenting a kaleidoscopic fan of urban images retrieved from the internet and data mined for their visual qualities by a custom-designed, visually intelligent software. *No-Ta-Ti-On,* the software used, analyzes parameters of content and form in order to establish aesthetic patterns in the database, and control how this patterns move across the video wall projection, their morphological behavior, and their flux speed correlation through interaction with users' motion.

The project is an expression of how digital applications of data clustering can use the Internet as an easily accessible database of randomly organized audio and video data, to operate dynamic combinations that generate unimaginable images of the global city that go beyond information into creating a dynamic visual poetry. More than retrieving information from the mining of the data, *100.000 Streets* is more concerned in its emergence as an aesthetic experience.

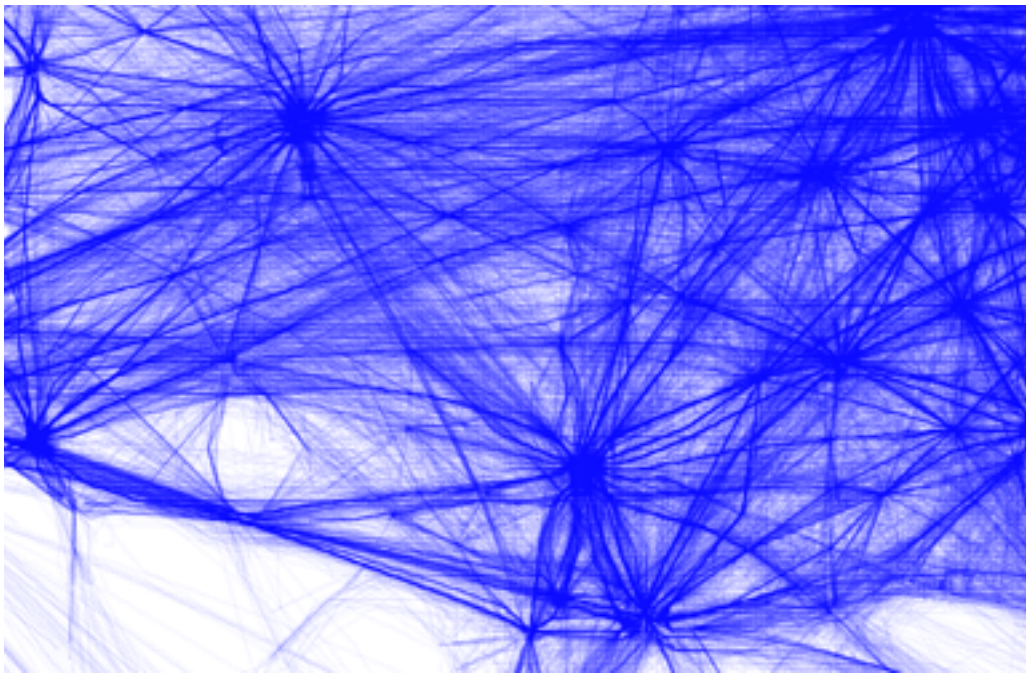

Fig. 141: Flight Patterns detail (Koblin 2006).

Aaron Koblin's *Flight Patterns* (2006) appears similar to a digital painting turned into a 24 hour animation, made by data mining the skies. Koblin's piece data-tracks

flights in the United States in real-time, to illustrate specific aircrafts, and compare the differences in flight patterns between the ten most active aircraft models into a beautiful colorful weave that traces the shape of the country from dawn till dusk. Koblin's aim was to see or make visible the way the *Flight Patterns* made distinctive the country's spinning daily routine, visible in the ebb and flow as planes' routes erupt on the East Coast in the morning and flow over to the West and Hawaii.

The experience of *Flight Patterns,* especially its high definition 24 hour video animation, is deeply aesthetic in its colorful flux crescendos and even mesmerizing by its complexity and quantity, particularly when the viewer mentally embodies the little pixilating traces into actual planes full with living human beings. Koblin originally developed the project as experiments for Hessels & Dunne's *Celestial Mechanics* (2005-2011) project, a planetarium-based artwork installation that visualizes data of artificial aerial technologies, hovering, flying, and drifting above our planet, hence *Flight Patterns*' contents and design vocation for aesthetic immersion and even the sublime transcendence of the planetarium experience.

Cory Arcangel's *Data Diaries* (2003) is a hack that tricks Quicktime into reading the binary data that passes through the author's computer random access memory every day, resulting into a collection of abstract data "movies" that chronicle at bit level his interactions with his computer each day. Galloway (2003) refers to *Data Diaries* as a computer's memory turn into Video Art and as an expression of the computers' subconscious, if computers actually had one.

Data Diaries uses Quicktime as a moving image canvas that directly converts the data in the machine's entrails into visual expression. It turns all sorts of computer processes into an aesthetic expression; the glitch, the error, the noise, the uncanny in the computer's subconscious is brought to the forefront as a visual output trick.

Both *Minitasking* by Schoenerwissen (2002) and *Artport Idea Line* by Martin Wattenberg (2001) operate an interesting balance between utility and aesthetic refinement.

Pascual and Hauer's *Minitasking* is a graphical browser that visualizes the *Gnutella* network, providing an engaging visual rendering of the dynamic temporary peer-to-peer networks created by their users, and bringing forward a degree of visual transparence to data exchange and network stability in collective and dynamic environments. In what is considered the first visual client to surf the *Gnutella* network, users' queries are constantly popping as interconnected color-coded bubbles that float around the screen, their size and color correlating to the amount of content they host. As soon as the user establishes a connection the application starts visualizing the bubble threads in the network with additional multi-color information on incoming and outgoing queries pixilating around the threads, and constantly giving visual and audio feedback to the user about the network's effervescence.

The audiovisual experience of the interface is mesmerizing to a point of bringing out the voyeuristic tendencies in anyone that watches the search strings appear as constantly moving beautiful visual elements that are almost a view into people's minds (Pascual & Hauer 2002b).

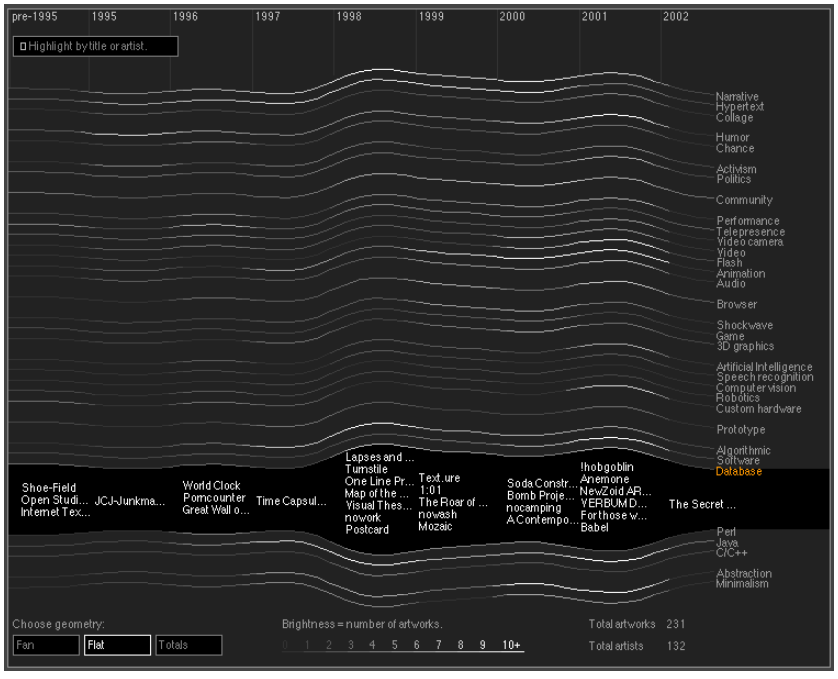

Fig. 142: Artport Idea Line (Database) (Wattenberg 2001).

Wattenberg's *Idea Line,* the first commission for *The Whitney Artport* Website (2001), also know as *A Net Art Idea Line,* maps the multiple paths or lines of thought travelled by Net Art through time. The piece's visual interface elegantly manages 231 projects by 132 artists, distributed by 33 horizontal idea lines, corresponding to multiple categories and classifications that range from specific media to programming language environments, and divided vertically in columns corresponding to yearly periods.

Owing to the collaborative spirit of the Internet as a medium, the artworks listed in the piece were compiled through a public call to Net Art forums generating a response by almost 100 artists. In addition, and completing the project's data collection, the *Idea Line* authors entered data on many popular or influential artworks that were not covered in the public request response.

The particularity of the piece lies in its capacity to elegantly deal-with and correlate a great amount of data in a user-friendly, intuitive, and responsive interface. The piece, both database and visual timeline interface, make information to naturally emerge by hovering over the timeline and across the multiple threads whose varying luminosity acts as a visual cue to the number of artworks produced each year, relating to a particular type or line of thought, so it is possible to have an idea a how prolific a line of thought is in the timeline at a glance. Hovering each line reveals the titles of the artworks, hovering each title reveals information about the artwork, clicking launches the project, shift-clicking reveals other pieces in the *Idea Line* by the same artist. It is also possible to search and filter by artist or project name, by imputing text in a search box, and see the results in the context of the overall *Idea Line,* or choose to visualize the *Idea Line* through three different geometries.

Both *Minitasking* and *Idea Line* are able to convey a feature-rich interface to complex data environments in an engaging manner and using aesthetics, both as an approach to solve utility problems concerning data exploration and its visual emergence as information, or as an intended aesthetically pleasing usage and outcome, whether by their natural flow, their engaging dynamic, or their elegant simplicity.

Sara Diamond's and *Code Zebra Inc.* collective *CodeZebra* project (2001) conjugates a visual chat and threaded discussion software, with performance events and responsive fabric designs. The *CodeZebra* chat tool is at the opposite pole of common chat interface design. It acts both as a visualization and dialogue tool that enables individual or collective conversations on the Internet, but providing a visual immersive three-dimensional environment employing animal pattern metaphors that reference the technological jungle in which human survival increasingly relies on communication skills.

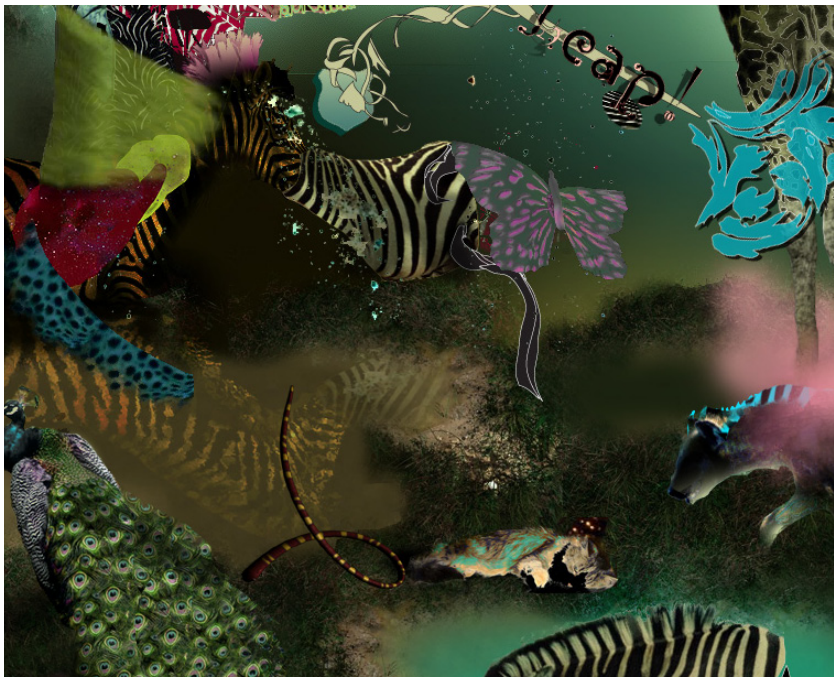

Fig. 143: CodeZebra (Diamond & CodeZebra Inc. 2002)t.

CodeZebra addresses the weaknesses in common chat technologies and environments relating to the interaction of large numbers of participants by providing a three-dimensional visual guide to what is being said, by whom and with which emotional tone, as well as creating a dynamic visual depiction of the underlying associations between related topics and issues, and keeping chat participants aware of their place in the big picture.

CodeZebra uses pattern recognition functions to convey emotional tone dynamics in communication through pattern mutation, developing an internal peculiar

aesthetic that expands outside the software environment into public performances in the physical world. Their themed club events and parades, display *CodeZebra* responsive fabrics, costumes and fashion garments that are derived from patterns created in the *CodeZebra* chat.

Diamond (2010) states that visualization systems that represent collaborative efforts and discourses require an aesthetic that allow the emergence of common and collectively constructed experiences and identities, as well as a design with high degrees of interactivity to facilitate the creation of those new identities or, Flusser's "intersubjectivities" (Druckery ed. 1999:203), that according to Diamond, is a more apt term to describe conjunctures in which identities conjoint productively.

Besides the referred examples, chosen for their distinctive, albeit diverse, aesthetic concerns, with different objectives, approaches and outcomes, it was already pointed out that the categories are not mutually exclusive and project samples referred in the transcendental section are also naturally aesthetical, or rely on rich aesthetic exploration in order to transcend or awe.

Relevant examples are for instance Hansen and Rubin's *Listening Post,* a meditative, sublime, elevating, hypnotic, captivating and purely aesthetic experience of the database as a "dynamic portrait" of online communication; or Herwig Weiser's *Zgodlocator,* a digression into data as magnetized raw materiality, sculpted by energy into a deep sensory and uncanny experience. Jason Salavon's *Portrait (Rembrandt),* from his amalgamation series, creates an aesthetic of its own by providing impossible images that compress time and quantity in an unique ghost-like layer, while Alex Dragulescu's *Spam series* turns abject data into lush vegetation or intriguing architectural forms of undeniable aesthetic beauty.

The commitment of data to sensory experience is subject to aesthetic concerns and decisions, particularly when this form of data practice takes place in creative contexts such as art or design. Consequently, the reference to other projects in the study's sample could proceed to include the totality of the sample units. The referred projects remain as paradigmatic examples of aesthetical concerns pertaining data

exploration, and particularly, the pursuit for aesthetics as a fundamental exploratory trait.

Conflations

For the purpose of category reduction, further aspects or dimensions characterizing exploratory design and extracted from Fallman's model, such as the Possible, Ideal, Alternative, Suggestive, Provocative, and Subversive were conflated or sub-categorized into the four previously defined categories of Societal, Political, Transcendental, and Aesthetical as follows:

Exploration characterized as the seeking for new possibilities, or what is Possible, rather than the truth or the real, conflates with transcendence in the Transcendental section. When connected with the pursuit of an Ideal, or Idealistic in itself, rather than aiming for the particular or the universal, it conflates in the Societal or Political categories—if that ideal is directed towards societal aspects or political ones. Although it can also be argued that those ideals be of an aesthetic nature, and thus the conflation would be in the Aesthetical category or even in the Transcendental one.

The striving for Alternatives, can conflate in any of the categories, be it the Societal, Political, Aesthetical, or the Transcendental. Particularly in the Transcendental category, when those alternatives are undertaked through Suggestive, Provocative or Subversive approaches. Suggestive, Provocative, and Subversive approaches can also stand on their on, or, as referred to when connected to Alternatives, conflate onto each other, or idependently into other categories, such as for instance the Political or the Societal ones.

We understand that category reduction is a characteristic of research's effort to rationalize thought and synthesize categorization, however, in the context of our study, we also found relevant to consider the rich nuances in the nature of exploration. From this point of view, more than aiming at the dissolution through the conflation of the referred aspects, this study considers them as further refinements of the major categories. Owing to the exploratory nature of the study, it is also possible to expand the category / sub-category model into considering every referred aspect as

an interconnected network of independent characteristics, that can aggregate under zones of influence in order to parse every artifact specificity and present a rich and detailed description of their complexity.

Exploration as thriving to show Alternatives and alternative futures can be observed in several selected samples of projects or of aspects of projects. It can be argued that Manovich's *Soft Cinema* (2002) poses as an alternative to cinema narrative by proposing a database-driven movie that re-imagines the future of cinema as an algorithmic generative narrative. Pocock's et al. (2002) *Unmovie* (2002) proposes a similar digression to traditional cinema by standing as an online participatory cinema project that is generated dynamically by queries to a database of existing net video clips. Similar explorations can be observed in McCoys' *Soft Rains* (2004), in this instance through computer controlled automatic edition that makes visible the process of filmmaking, outlining its roots as a databased medium and turning it into a live digitally enhanced realtime automated experience, while Thomson and Craighead's *Template Cinema: Short Films About Flying* (2002) uses the Web as a vast database to create an endless number of short films by recycling existing data. It can also be argued that the aforementioned examples explore an Alternative future for cinema by Subverting or Transcending its traditional codes, and as such also stand as thriving for the Possible or even the Ideal.

If these projects show new possibilities or pose as alternatives for common film production, others propose a similar approach in music or sound composition, namely Offenhuber's *(Two Line) Orbital Elements* (1998), Peljham's *SOLAR* (1998), and Kaye and Snow's *Firmament* (2001-2003), respectively mapping satellite motion, the electromagnetic spectrum of telecommunications, and radio telescope data into sonic expression.

I/O/D's The Web Stalker (1998), Wisniewski's *netomat™* (1999), and Napier's *Riot* (1999) show an Alternative way to browse the Web by Subverting common browsing approaches, and even offering Provocative commentaries as is the case with Napier's Riot, by merging contents and ideologies from opposite poles of the Web, such as, for example, the *Vatican Website* with *Hell.com* or *Microsoft.com* with the hacker quarterly *2600.org*. Similarly, Diamond's *CodeZebra* (2002) stands as an Al-

ternative to traditional chat environments by presenting itself as a chat-software at the vanguard of advanced chat technology, taking place in a visual 3-D space and using animal print metaphors in its design and functionality.

Provocative and or Subversive approaches can be observed in Galloway and *RSG*'s *Carnivore* (2001) by subverting governmental spyware into an open-source artist-improved version that is made available for artistic exploration. While *Carnivore* draws attention to the fact that the United States' Intelligence agencies spy on the general public, Bunting and Brandon's *The Status Project* (2004) provide a database of *do-it-yourself* strategies to meet the bureaucratic requirements for the possession of official identification from birth certificates to passports in the UK; and Watcher and Judd's *Zone*Interdite* (2006) escapes the censorious blackout maskings of perception constituted by military restricted areas through its reconstruction as artificial 3D virtual worlds made available to the general public. A similar Provocative / Subversive exploratory approach can be argued about Lombardi's *George W. Bush's …* (1999) piece by its focusing on the roles that cronyism and insider trading played in the fortunes of former President George W. Bush in the 1980s, leading Fry (2009) to refer Lombardi's work as an illustration of the importance that working with data has to the future of design.

Asserting the Idealistic nature of the project samples based in the study's data is problematic, particularly due to the nature of the data and the unobtrusive data collection method used. Evidence of idealism, regarded by Fallman (2007:13) as a tension between design practice propensity toward the Particular—by working in contexts of extreme specificity and constrains—and design studies academic pursuit of Universality, can until a certain point be inferred as a pursuit of transcendence, or even as a general trait in artistic practices. Nevertheless, it is acknowledged that would be far more practical to gain insight of such particular matter by interrogating the authors of the studied artifacts directly using common reactive measures.

Given

Finally, remains to refer to three more aspects mentioned by Fallman to characterize exploration, namely Experimental, Proactive and Self-initiated. They are aggregated in a category container designated Given, primarily relating to the fact that we thought of them as being a matter-of-fact—a given—in the collected data and its general working context, even if it is hard to affirm, based on the collected data and the used methods, to what extent an artifact is Experimental, Proactive or, less problematic although context-specific, Self-initiated. Furthermore, Experimental constitutes in itself a synonym of Exploration, and the Proactive and Self-initiated aspects could be eligible for conflation. While the Experimental and Proactive traits are hardly captured with the collected data method used, the Self-initiated aspect was confronted with several examples of commissioned artifacts in the collected data.

Fallman (2008:8, 2008:18) (Fallman & Stolterman 2010:269) refers Experiment or experimental as another aspect of exploration or exploratory, because it seeks to test ideas and to ask "What if?" questions through design—but also to experiment to reveal alternatives to the expected and traditional. Moreover, it can be taken into account the fact that Experimental is also understood as a synonym of exploratory and investigational.

Thus it can be argued that exploratory processes are experimental in nature, particularly regarding contexts such as data exploration. In these contexts, quantitative abstractions or other types of complex data are committed to qualitative sensory perception through processes that certainly imply experimental approaches. While it is safe to affirm that the nature of exploration encompasses experimental approaches, it is problematic to assert their extent in the study's data. Artistic practices breaking new grounds, such as in the context of the database exploration studied in this project, thrive on innovation and cross-disciplinary experimental approaches, and it is thus expected that they be experimental.

Fallman (2008:7) (Fallman & Stolterman 2010:269) mentions Proactivity as another trait of exploration, implying that the design researcher is involved in bringing forth a product, service, or artifact of some kind, although rather than being impelled

by user needs, client demands or market opportunities, exploration makes use of theories, ideals, technologies and other alternative foundations for design, bringing forward a difference in perspective from which its artifacts are constructed. In this sense, Proactivity is certainly experimentation-driven as it also appears connected to the idea of Self-initiated projects that Fallman (2008:7) uses to characterize the nature of exploration. He states that another sign of its recognition is the fact that the typical client in the exploratory area of activity is the researcher's (designer's, author's) own agenda—the projects often being self-initiated (Fallman & Stolterman 2010:269).

The sign that a project is Self-initiated or a result of Proactivity it is practically a given in artistic practices and in almost all of the data collected for the study, even when its authors present themselves as designers or other practitioners. It is also a fact that several projects in the data are explicitly referred as resulting from specific commissions; whether by private clients, as is the case with Wattenberg's *Map of the Market* (1998) for *The Wall Street Journal's SmartMoney;* Klima's *ecosystm* (2000) for the investment company *Zurich Capital Markets;* and Legrady's *Eternal Summer* (2000) for *Ebner, Stolz and Partners* corporate office in Stuttgart, Germany; or cultural institutions, museums and art centers, namely James Buckhouse's *Tap* (2002) for the *Dia Center for the Arts* in New York; Legrady's *Making Visible the Invisible* (2005) for the *Seattle Central Library;* Napier's *Point to Point* (2001) for *The Whitney Museum of American Art* in New York; or Bleecker, Paterson and Zurkow's *Mobile Scout: A Field Guide* (2004) for the *Banff Centre in Canada.*

Apparently, user needs, client demands or market opportunities (Fallman & Stolterman 2010:269) can have different meanings when considering different fields of action as for instance Art, Design or Science, but the perspective from which the artifacts are created, namely the extensive use of theories, ideals, technology and other alternative foundations (ibid.), can indeed, as a perspective, be considered transversal across disciplines, implying a strong emphasis on authorship. After all, a designer can also be commissioned by the particularity of its work, and the same is valid for a scientist's contribution, as is the case in interdisciplinary multi-authored collaborative projects. In addition to this mindset, Sayer (1999) brings forward the idea of post-disciplinary studies as a context in which participants forget about their own

disciplines and engage in a common perspective. Thus, the issue of Self-initiation of projects can be transversal or have particular meanings according to the disciplines under consideration.

The study acknowledges Fallman's use and meaning of Self-initiated as a sign of exploration in design research, particularly as a digression regarding common design practice—in which user needs, client demands or market opportunities are the norm—but also, acknowledges, a general meaning that regards Self-initiated as self-driven, and thus primarily experimental, investigative, and as such an exploratory sign.

Again, the identified commissioned artifacts within the study's data were certainly a result of the individual self-driven professional career of the corresponding authors, whose practices are also certainly infused by theories, ideals, technology, and other alternative foundations, independently of the mentioned artifacts being a result, or not, of external commissions. It is thus safe to affirm that in the context of the study's collected data, the fact that the artifacts were commissioned by external entities does not lessen its singularity and the artifacts appear in continuity with similar work by the same authors created under different circumstances.

To summarize, although Self-initiated or Proactive terms can have discipline-specific meanings, for instance meaning differences in commission's constrains, they can nevertheless be considered transversal—particularly understood as strong authorship or particular perspectives—and constitute useful aspects regarding the characterization of exploration in the study's context. In this sense, if the fact that a specific artifact is Self-initiated (or not), and the data presents evidence of this, or if it is Proactive, which is difficult to attain with the used method for data collection, constitute useful traits to characterize exploration, which is experimental in nature, the collected data does not show substantial evidence as to constitute them into separate categories that stood on their own, nor did we found useful to discard them from our category system framework.

As referred, although category reduction is a common trait in research as a mean to rationalize thought and synthesize categorization, we found also to be important

in our study to consider the subtle nuances in the nature of exploration. Accordingly, more than aiming at their dissolution through the conflation of their referred aspects, be it in the Conflations category or in the Given one, our study considers these aspects as further refinements of the main categories.

Our resulting core category system is embedded in an open model network framework whose independent characteristics can aggregate under zones of influence in order to parse every artifact specificity, and present a rich and detailed description of its complexity and as such better attest to the nature of its exploratory traits.

Discussion

Summary

> *Cyberspace. A consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphic representation of data abstracted from the banks of every computer in the human system. Unthinkable complexity. Lines of light ranged in the nonspace of the mind, clusters and constellations of data. Like city lights, receding. (Gibson 1984:69)*

> *The value of what is stored in databases lies in how it can be used in the present, and in its operationality rather than its meaning. (Brouwer & Mulder 2003:5)*

William Gibson's literary reading of data and databases as the source material of Cyberspace, that he created by transforming a data matrix into a landscape and thus explore its potential as a stage for his futuristic narratives (Hayles 1999:38), embodies the motivational and poetic backdrop patent in our study, at odds with a utility discourse that has its basis on data's face value on our knowledge society, and peoples' agency as explorers upon this world that presents itself before them as a huge constellation of databases right out of a science fiction novel.

The Nature of Exploration in Database Art Practices, the question that our study addresses, led us to focus our research into two main areas of inquiry. The first one has the intended purpose of providing an exploratory overview of database use in artistic practices. The second aims at characterizing the nature of exploration of that use in said practices.

In a first instance, and playing the part of a motivation for this project beyond William Gibson's prescient literature, there was a collection of individual projects that made use of data as their source material. That data was shaped and explored through burrowed knowledge and skills from different fields of work such as Computer and Information Sciences, Design, and Art. This collection of projects and its authors were identified under a diversity of sometimes interchangeable categorizations such as *Information Art, Data Art, Data Visualization or Information Visualization.* For the sake of inclusiveness and due to the interdisciplinary nature of the contributions to this field, the study opted to group this diverse output under the umbrella of Database Art, understood as the context that these practices explore and that as such, in this study, are termed Database Art Practices.

In a second instance, our research aimed at the definition of Exploration, and of exploratory, in the context of data, data-related, and database-related practices, aiming to delineate a provisional categorization of aspects that can contribute to the characterization of what exploration in this context might mean. In order to gain an understanding of exploratory approaches to data or data-related practices, the study draws from the fields of general research in Science and the Humanities; from John Wilder Tukey's (1977) Exploratory Database Analysis in Statistics; from Romantic notions relating to explorers and exploration; and particularly, from Daniel Fallman's (2008) formulation of Design Exploration as a branch of his Interaction Design Research model.

The data in our study was retrieved from two interrelated sources: a selection of 100 individual artifacts in database art practices extracted from a larger global database of 216 artifacts, which were identified as being database-related, and the associated literature to those artifacts, to their individual and or collective contexts, and to the identified field as a whole.

Acknowledging the worldwide dispersion of sources and information, and the 'transformative technology' (Lee 2000:115) of most interest in overcoming this dispersion that the Internet constitutes were the main reasons to opt for the *World Wide Web* as the main field of research and data collection source. Our study made use of our personal knowledge, the knowledge from others, identified as authoritative sources, and procedures similar to snowball sampling (Lee 2000:14) that enabled the identification of similar data from similar contexts (Trochim 2006), and conducted the process of data identification and collection.

The methods or measures used can be characterized as Unobtrusive and/or Non-reactive (Webb et al. 1966, 1981 qtd in Lee 2000), as they did not disturbed the social environment by direct questioning, interviewing or surveying its subjects, and refer to data gathered by means that do not involve direct elicitation of information from research subjects (Lee 2000).

We privileged the collection of artifacts aggregated in the context of exhibitions that were explicitly defined as exploring the database, data or information as their main subject, and from there, we expanded the collection through associated literature, such as texts and theory regarding those events, their sub-themes, and the included works. Similar artifacts from previously identified authors were also included in the sampling, as well as projects referred by multiple sources, while others were motivated by our personal knowledge and judgment on the subject.

Our relationship to the field of study, albeit through unobtrusive non-reactive measures, and as such constituting a different kind of immersion, still characterizes itself through the most important traits and rationale of the qualitative research methodological tradition and design. The study's topics needed to be explored, the research question's nature points to a qualitative study, and the researcher was unmistakably the instrument of data collection (Dartney-Mensah 2000).

Concerning the data analysis procedures, this study draws on Thomas' (2003) *General Inductive Approach* for qualitative data analysis, and coded our data through the lens of a pre-established conjunction of categories defining exploration. As a start-

ing point, this set of *a priori* assumptions, arose from the theoretical literature data, such as Fallman's model for Design Exploration or Explorative Design (2010), and, at least as a general direction, the ideas in Stalbaum's Exploratory Data Formalism (2004a), and from the raw data itself—the 100 artifacts contributing to the study's general data.

We found out that Fallman's set of concepts, a conjunction of concerns, roles, aspects, and dimensions regarding design exploration, were not only ample enough to be transferred as general traits of exploration to the context of our study, but also revealed to be extremely fruitful in the definition of the resulting core categories that contributed to our open model network of characteristics of *The Nature of Exploration in Database Art Practices.* The core categories in our framework disclose as key features, a category label and the corresponding description of its key characteristics, scope and limitations, the illustrative data associated with each category, and the potential linkings with other categories. Finally, our core category system is embedded in an open model network framework with no hierarchy or system.

Our core category system reports six categories concerning the Nature of Exploration in Database Art Practices, divided into four main individual categories or themes: Societal, Political, Transcendental, and Aesthetical, and two adjacent ones, grouping several sets of interrelated characteristics: Conflations and Given.

Although category reduction is acknowledged as a common trait in research as a mean to rationalize thought and synthesize categorization, we found also to be important in our study to consider the subtle nuances in the nature of exploration. Accordingly, more than aiming at their dissolution through the conflation of their referred aspects, be it in the Conflations category or in the Given one, our study considers them as further refinements of the main categories. Our resulting core category system is thus embedded in an open model network framework whose independent characteristics can aggregate under zones of influence in order to parse every artifact specificity, and present a rich and detailed description of its complexity and as such better attest to the nature of its exploratory traits.

Interpretation of Findings

To articulate our interpretation of the findings we draw on the study's purpose to provide an exploratory overview of database use and the nature of exploration in artistic practices. As a starting point, as referred in the design section, our research study is in itself exploratory, its aim is primarily to identify, describe and explore the specificity of database use and exploration in artistic practices. Second, database exploration in artistic practices, the field of study whose artifacts constituted the initial motivation for the study and the final core of its collected data, had to be identified and circumscribed as a trend in general artistic practices. Third, the emphasis on exploration (Stalbaum 2004a) (Tukey 1997, 1980) as a filter to analyze the collected data, led us to formulate *a priori* assumptions of what exploration could be in our field of study, and to a set of concepts borrowed from Fallman (2008, 2010) which were used to interrogate the data for results.

As previously referred in the significance section, the study brings to the fore a set of relationships between its own exploratory and descriptive nature, the characteristics of exploration in specific research practices such as the ones formulated in Fallman's research model, the exploratory as a complementary attitude and philosophy in data-related analysis for statistical purposes (Tukey ibid.), and finally, the exploratory traits that artists and other practitioners use in their data-based projects.

Another important referred aspect to note and discuss, is the fact that from an exploratory point of view, this research makes evident the parallelisms among researchers and other database practitioners—such as the authors of the study's artifacts—placing itself at a meta-level, because the subjects and methods present on the data it collected and analyzed, echo the methodological approaches of the study's own research process, because, after all, we all work with data.

Our work reveals database exploration as an identifiable trend in artistic practices, and we were able to identify and collect a significant sample of artifacts in order to draw and offer a comprehensive portrait of the studied phenomenon. The purposive sampling method used aimed for diversity and heterogeneity. The artifacts included

in the data sampling emerged from the literature and were also found in related contexts. Some identified objects pointed to related work in a process similar to snowball sampling, allowing us to provide for a detailed overview of the practice through the data collected.

Although we can't claim to have collected the totality of the work available on the subject, we did manage to identify and obtain a significant collection of 216 individual artifacts from which a unit of analysis of 100 artifacts was extracted. We privileged the collection of artifacts that were aggregated in the context of exhibitions. These were explicitly defined as approaching the database, data or information as their main subject. Following that decision, the study could take advantage of the associated literature, such as texts and theory regarding those events, their subthemes, and the included works. Similar artifacts from previously identified authors were also included in the sampling, as well as artifacts referred by multiple sources, and others were motivated by our personal knowledge and judgment on the subject.

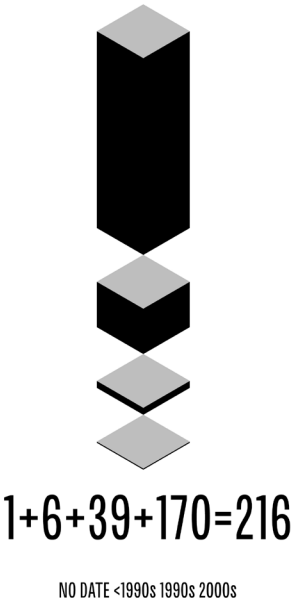

Fig. 144: 216 artifacts sorted per decades.

Our study allows for a comprehensive overview of database artistic practices and maps its artifacts, its most prominent authors, its main exhibitions, its critics and theorists, and its critical texts and articles. Our collected artifacts, constituting the study's unit of analysis, range from Haacke's *Visitors' Profile* …, from 1971, part of the exhibition *Database Imaginary,* 2004-2005, co-curated by Sarah Cook, Steve Dietz and Anthony Kiendl at the *Walter Phillips Gallery, The Banff Centre,* Alberta, in Canada, to four artifacts from 2009 that are thirty-eight years older.

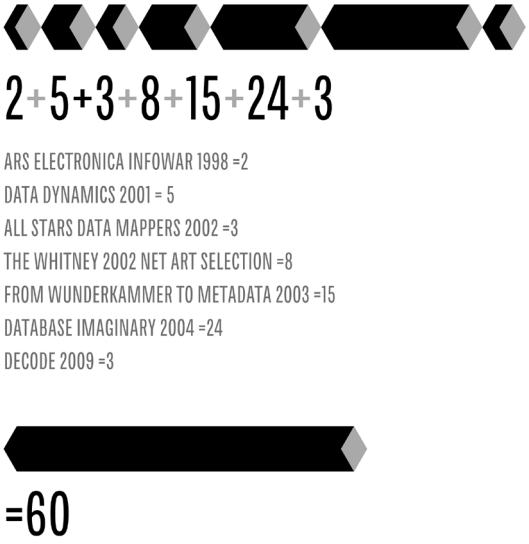

Fig. 145: 60 artifacts sorted per exhibitions.

From the 100 sampling units chosen, 57 artifacts, constituting the core of the unit, originate from six exhibitions which were held in a time span of over six years form 1998 to 2004: *Ars Electronica 1998 INFOWAR Information.Macht.Krieg,* curated by Gerfried Stocker; *Data Dynamics,* 2001, and *The Whitney Biennial 2002 Net Art Selection,* both curated by Christiane Paul at *The Whitney Museum; All Star Data Mappers,* 2002, curated by John Tonkin; *From Wunderkammer to Meta-Data - Data Knitting,* presented at the *Dutch Electronic Arts Festival* in 2003; and the *Database Imaginary* at the *BANFF* in 2004. The *Decode: Digital Design Sensations,* 2009-2010, an exhibition at the *Victoria & Albert Museum,* contributes with three additional ar-

tifacts to the data collection list. The remaining fourty artifacts relate to the already referred ones, to their authors, and to the study's literature. As a curator at *The Whitney Museum of American Art* and having written key texts on the subject, Christiane Paul played an important role curating both *Data Dynamics* and *The Whitney Biennial 2002 Net Art Selection,* that are the precursors of the most important exhibitions on the subject of database artistic practices and the biggest contributors to our data collection: *FromWunderkammer to Meta-Data - Data Knitting,* at the *DEAF* in 2003, and of course, *Database Imaginary* at the *BANFF* in 2004. *Soft Cinema* (2002) by Lev Manovich, the key theorist of the database as the cultural form of the 20th Century (Frieling 2004), allowed us to connect the two major referred exhibitions.

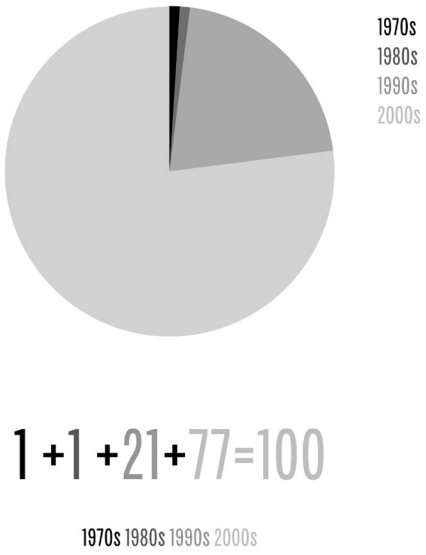

Fig. 146: 100 artifacts sorted per decades.

Looking at the decades, we find out that 77 artifacts are form the 2000s, 21 from the 1990s, and 2 from previous decades, although one of them is Günther's *Worldprocessor* from 1989, only one year away from the 1990s, and the real outlier, the aforementioned Haacke, from 1971, is included in the *Database Imaginary* exhibition and presented as a precursor in database art. We can safely affirm that the majority of the artifacts constituting the body of work that allowed us to consider a database

artistic practice, make themselves evident in 1990s and particularly in the first half of the 2000s.

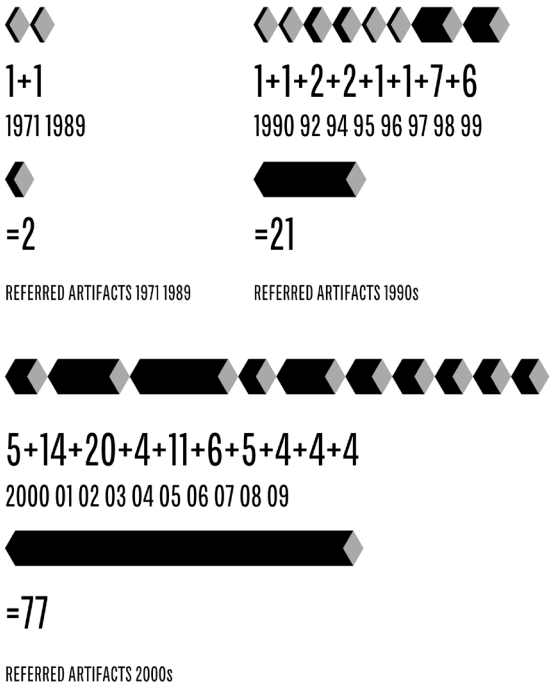

Fig. 147: 100 artifacts sorted per decades and per years.

As a fact, 60% of the artifacts in the collected data occur in the period between 2000 and 2005, which is also the period of the major exhibitions explicitly regarding the database and data as the main trait in their curatorial statements. Considering our collected data, we can speak of this period of 5 years as a "golden" era of database artistic practices. From 2005 onwards database art was "naturally" assimilated in the general discourse of digital art, and data became part of the mainstream culture parlance. The practice of data-based art is widespread and projects are abundant, but no more subject of dedicated exhibitions and critical scrutiny as in the referred period, conversely, and as stated, data's societal and political traits potential reached mainstream media and public attention.

The definition of a field of study concerning database exploration in artistic practices constitutes in itself an important contribution to the theoretical discussion on the subject of database exploration in that context. To our knowledge our study is the first attempt to provide a comprehensive overview of this field of work whose critical texts and artifacts were atomized in time and space, across all sorts of publications, and exhibitions. This primary contribution in our study happens in line and as a step in the process of questioning the nature of exploration in database art practices—our research question. Our study acknowledges the exploratory trait implied in the dynamic between data and information—the former regarded as a raw state of the later—but also a move beyond mere information extraction and its connection to an utility discourse regarding database practices, into an exploratory approach that looks into new forms of insight and breakthrough discovery through creative expression, and aesthetic transcendence.

To characterize the nature of exploration in our newly identified field of database art practices, we draw on Thomas' (2003) *General Inductive Approach for Qualitative Data Analysis,* and coded our data through the lens of a pre-established conjunction of categories defining exploration. As a starting point, this set of *a priori* assumptions, arose from the theoretical literature data, such as Fallman's model for design exploration or explorative design (2010), and, at least as a general direction, the ideas in Stalbaum's exploratory Data Formalism (2004a), or from the raw data itself—the 100 artifacts contributing to the study's general data.

We found out that Fallman's set of concepts, a cluster of concerns, roles, aspects, and dimensions regarding design exploration, were not only ample enough to be transferred as general traits of exploration to the context of our study, but also revealed to be extremely fruitful in the definition of the resulting core categories that contributed to our open model network of characteristics of the nature of exploration in database art practices. The core categories in our framework disclose as key features, a category label and the corresponding description of its key characteristics, scope and limitations, the illustrative data associated with each category, the potential linkings with other categories, and finally, our core category system is embedded in an open model network framework with no hierarchy or system.

Our core category system reports six categories concerning the nature of exploration in database art practices, divided into four main individual categories or themes: Societal, Political, Transcendental, and Aesthetical, and two adjacent ones, Conflations and Given, that group several sets of interrelated characteristics.

The Societal trait of exploration relates to the fact that its expression and the character of its artifacts provide an interface with society at-large, by offering commentaries on societal phenomena, by becoming statements or contributions to ongoing societal discussions and as such having a voice in shaping the future of society. We found out that the Societal trait has a great expression in our study's collected data. We believe that this relates to the fact that the analyzed artifacts' source material is data, and that data is inherently social. Data's production, collection, and analysis takes place in social contexts and among social interactions, and so does most of the areas of activity in which these artifacts were imagined and materialized. Although we hold to the notion that, at a fundamental level, the societal trait is transversal to the entire data collection, our choice for the data as evidence of societal categorization primarily concerns artifacts that more explicitly demonstrate a conscious exploration of societal issues, whether by providing direct involvement in social contexts, by offering exhaustive commentaries on social phenomena, or by overtly aiming at social transformation and change.

The Political trait of exploration can, of course, link directly to the Societal one, its Political artifact samples are naturally Societal ones that demonstrate political concerns. Data and database connection to society and societal matters are also deeply entangled with issues regarding government, authority, power, and control exerted upon individuals and their lives. The Political agenda in our data collection is also significant, in spite of the history of people's constitution as abstracted, surveilled and controlled data entities being quite long, some of the dynamics of data collection, and the data typologies involved are novel and powerful. Some argue (Thorp 2011) that we are existing in a world where data is being collected about us on a massive scale, and currently being stored, analyzed and monetized by corporations, with little or no agency by the people to whom the data is supposed to belong. So naturally, the artifacts analyzed in our data collection and categorized in the Political and Societal categories of data exploration, offer commentaries that attest to this

problematic, and attempt to provide frameworks—social, political, intellectual or technological—for people to regain sovereignty and agency over the collection, storage, and manipulation of data about themselves and their social contexts.

The Transcendental trait of exploration relates to an aspiration or desire to transcend the expected, and the traditionally accepted paradigms. It attempts to take a glimpse at the future by going beyond and breaking down all sorts of boundaries, often by problematizing, criticizing, provoking or subverting. It is also connected to the romantic idea of the explorer as a figure of transcendence in its search for the overwhelming sublimity. The idea of vastness, the unlimited grandeur, the ungraspable and the overwhelming that is present in the Kantian sublime relates directly to several notions of digital data non-human scale and incommensurability. The study's collected data presents solid evidence of all the referred aspects of transcendence, whether pursuing to transcend paradigms of style, use, and technology or aiming at transcendence as an outcome that reflects directly on the artifact's audience and their experience of the piece, sometimes through beauty, the sublime or even the uncanny.

The Aesthetical trait of exploration comprises a significant diversity of considerations regarding aesthetics and aesthetic principles involved in database-related practices, to a point that is hard to single out an artifact in our data collection that doesn't reveal any level of aesthetic consideration, if not from the fact of their origin being primarily artistic contexts or artistic approaches to database exploration. We do believe that some artifacts substantiate a more thorough exploration of aesthetic engagement, as they evade the discourse on utility, clarity, precision, efficiency and functionality of information extraction opting for expression, immersion, sensation, and affective experience, or sometimes even for transcendence. It is also a fact that some artifacts manage to operate an effective balance between the apparently opposing characteristics. Moreover, an aesthetic of transcendence can also make sense to the extent that some artifacts referred as transcending or transcendental in nature can also be categorized as aesthetical, whether by pursuing beauty, sublimity, or the uncanny.

The Conflations category doesn't represent a unique trait in exploration, but rather a combination or a conflation of aspects that blend into the four main themes. It can be said that the Conflations category is a conflation of several aspects such as the Possible, Ideal, Alternative, Suggestive, Provocative, and Subversive, that in themselves are individually conflated in the more representative and engulfing categories. Our option for the adjacent categories such as Conflations and Given, was to both operate category reduction without loosing the subtle nuances in the nature of exploration. More than aiming at their cessation through the conflation of their referred aspects, we consider them as further refinements of the main categories.

In this sense, exploration's seeking for new possibilities, or what is Possible, conflates with transcendence in the Transcendental section. When this aspect is connected to the pursuit of an Ideal, or Idealistic by itself, conflates in the Societal or Political categories if that ideal is directed towards societal aspects or political ones, although it can also be argued that those ideals be of an aesthetic nature, an thus the conflation would be in the Aesthetical category or even in the Transcendental one. The striving for Alternatives, can conflate in any of the categories, be it the Societal, Political, Aesthetical or the Transcendental. Particularly in the Transcendental category, when through Suggestive, Provocative or Subversive approaches. The Suggestive, Provocative, and Subversive traits can also stand on their own, or, as referred when connected to Alternatives, conflate into each other, or into other categories, such as for instance the Political or the Societal ones.

Finally the Given category contains three more aspects that we though of as a matter-of-fact—a given—in the collected data and its working context, even if it is hard to affirm, based on the collected data and the used methods, to what extent an artifact is Experimental, Proactive or, less problematic although context-specific, Self-initiated. We found that the Experimental aspect can constitute in itself a synonym of Exploration, and that the Proactive and Self-initiated ones are eligible for conflation. While the Experimental and Proactive traits are hardly captured with the collected data method used, the Self-initiated aspect was confronted with several examples of commissioned artifacts in the collected data. Nevertheless, we also found that in the context of the study's collected data, the fact that the artifacts are commissioned by external entities does not lessen its singularity, and the artifacts

appear in continuity with similar work by the same authors created under different circumstances.

We took into account Fallman's use and meaning of Self-initiated as a sign of exploration in design, particularly as a digression regarding common design practice—in which user needs, client demands or market opportunities are the norm—but also, acknowledged, a broader meaning that regards Self-initiated as self-driven, and thus primarily experimental, investigative, and as such a broader sign of exploration. To summarize, although Self-initiated or Proactive terms can have discipline-specific meanings, for instance meaning differences in commission's constrains, they can nevertheless be considered transversal—particularly understood as strong authorship or particular perspectives—and constitute useful aspects regarding the characterization of exploration in the study's context. In this sense, if the fact that a specific artifact is Self-initiated (or not), and the data presents evidence of this, or if it is Proactive, which is difficult to attain with the used method for data collection, constitute useful traits to characterize exploration, which is experimental in nature, the collected data does not show substantial evidence as to constitute them into separate categories that stood on their own, nor did we found useful to discard them from our category system framework.

As referred, although category reduction is a common trait in research as a mean to rationalize thought and synthesize categorization, we found also to be important in our study to consider the subtle nuances in the nature of exploration. Accordingly, more than aiming at their dissolution through the conflation of their referred aspects, be it in the Conflations category or in the Given one, our study considers them as further refinements of the main categories. Our resulting core category system is thus embedded in an open model network framework whose independent characteristics can aggregate under zones of influence in order to parse every artifact specificity, and present a rich and detailed description of their complexity and as such better attest to the nature of their exploratory traits.

Limitations

The limitations concerning the data collection in our project are addressed from two different angles relating to issues of quantity and collection methods. For practical reasons and research specificity we decided to collect our data using unobtrusive measures, and of course, unobtrusive measures also have their own embedded limitations. We had no problems with quantity, although we acknowledged the trade-ins between the comprehensive sample in our study—allowing for a necessarily panoramic analysis, and the benefits that deeper analysis, concerning paradigmatic cases, would bring. Although we acknowledged shortcomings in capturing certain aspects in our collected data through the methods we chose to use, we do believe that regarding our study's nature and the attained results, our options expressively overcame those limitations.

Still, concerning our engagement in the data collection, whether considering our global database of 216 artifacts or their further sampling down to the 100 samples that constituted our unit of analysis, we must refer our substantial role in judging the eligibility of the artifacts. Nevertheless we relied on a design structure for data collection that is thoroughly documented in the study and solidly articulated with external contributions. Furthermore, our personal knowledge underlines the judgmental nature of the sample and its usefulness and appropriateness to the exploratory nature of the study.

Possible limitations regarding our framework, particularly relating to the applicability of its category system were also considered and taken into account. Regarding the category system in itself and the ontology of its aspects in a different field from the one in which it is applied to, we considered the argument that those aspects represent a digression from their field of origin's common traits and as such, that that is the reason why they are regarded as exploratory or as a sign of exploration. In this thesis, the exploratory trait would be the digression and not the aspects themselves. With that in mind we "questioned" our field of study's broader context of affiliation about those specific aspects and concluded that the same digression can be observed in that context. Furthermore our field of work has specificities of their own—data

exploration—that underline their inherent connection to the research trait in the model from which those aspects originate.

Future Research

Further research regarding our own data should concern their data mining and further exploration through similar techniques as the ones discussed in our study and exhibited in the studied artifacts. We believe that this approach is a natural step to further explore our collected data and gain additional insight unsought in our own project or even allow for the unsuspected to emerge through the data exploration.

Aspects in our category system that revealed to be hard to capture through our collection methods, can be further explored through more appropriate methods that for instance would consider direct engagement with the artifacts' authors through surveys or personal interviews. Although our study contemplates a broad analysis on artists' statements and articles, our panoramic approach and project's scope didn't allowed us to undertake a focused analysis on this specific data. Furthermore, we believe that in order to focus on specific traits of our model in particular, or the field in general, a direct engagement with their practitioners would certainly provide interesting research developments that would benefit from their personal insights and awareness on the subject. It would be interesting to complement our data with this additional contributions or even analyze it through different analytical methods.

Another recommendation for future research concerns the individual exploration of any of the traits formulated in our category system. For instance, one could pursue an investigation on the Societal aspect of database exploration, or even on the conflation of its Societal and the Political aspects, that could draw on Poster's (1990) ideas relating to Foucault, databases and participatory surveillance. Poster (1990:67) regards the database as the major container of language from the mode of information and believes that the articulation of its linguistic qualities and the corresponding political implications can be better captured through the interdependency between language and action in Foucault's analysis of discourse. To Poster (1990:93), the circuits of communication inherent in his formulation of the mode of information, and the databases they generate, promote Bentham's Panopticon as

enunciated by Foucault, and updates it in a Superpanopticon in which the people are not only disciplined to surveillance as they actively participate in the process, happily engaging in an endless form completion from its own home to feed the databases of the consumer society.

Other interesting research path, still concerning individual aspects or conflations on our framework, could explore the conflation between the Aesthetical and Transcendental traits of exploration. The Aesthetical trait in itself constitutes a fertile ground for deeper exploration, whether as a given in an area in which the commitment to visual form appeals to aesthetics as a field of inquiry, or regarding the critical and artistic value of work in the field as the essential issue to be formulated by an aesthetic of the database undertaken as an artistic research practice (Sack 2006).

The Transcendental aspect is a particularly interesting research path, especially concerning Jevbratt's (2004a) questioning about the methods to allow the sublime to operate, and her case for Burnahm's and Galbraith's proposition for the effectiveness of more intuitive esthetic decision-making when concerning the understanding of complex systems. She establishes a parallel between this notion and Kant's reasoning about the empowering mobilizing effect that the ungraspable and overwhelming sublime has in our organizational abilities, which in her opinion, allow people, in the right circumstances and drawing on sensations of the sublime, to make intuitive and better understandings of the data.

Other appealing research path could implicate using the resulting framework to interrogate a different dataset. It would be interesting and challenging to consider data mining other working contexts that, for instance, are closer to the field of design research, from which Fallman's working model originates. His reference to design explorations—or "critical design"—as a use of design to critically comment on the relationship between technology and society, and his regarding of critical design as an extreme form of design exploration in which the design researchers knowingly aim at stating a subjective standpoint or a design direction they see as desirable is at the heart of our own practice as a design researcher and practitioner. In this sense, the area of critical design and its production output emerges as a natural setting to further develop and fine tune our model.

Critical Design's standing as a mechanism to instill debate and bring visibility to an area that makes use of speculative design approaches to challenge the narrow assumptions and preconceptions about the role of products in everyday life (Dunne 1999, 2001; Dunne & Raby 2007), appear to us as the appropriate arena to channel our future research and test our model as an operative tool.

This field of work, relating or appearing under different monikers such as conceptual design, interrogative design, speculative design, or design fiction, presents challenging research opportunities, particularly due to its proclivity as a forecaster of the future, its ability to make abstract issues tangible, and its role in public debates about the social, cultural and ethical impact on everyday life of emerging and future technologies.

Our study's core category system promise as an analytical tool can also finally attest to the categorized exploration traits' potential as a set of guidelines in order to promote a conceptual approach to research-based design.

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Bibliography

Adams, Matt. "Can You See Me Now?." aRt & D Research and Development in Art. Ed. Joke Brouwer et al. Rotterdam, NL: V2_Publishing/NAi Publishers, 2005. Print.

Adriaansens, Alex. "Foreword." Making Art of Databases. Ed. Joke Brouwer, Arjen Mulder, and Susan Charlot. Rotterdam, NL: V2_Publishing/NAi Publishers, 2003. Print.

Allen, Shawn. "Data Visualization Syllabus Introduction." Data Visualization 2010. Web. 30 July 2010. <http://interactiondesign.sva.edu/classes/datavisualization/2010/07/08/introduction/>.

Andrews, Keith. "Information Visualization: Course Notes." 2009. Web. 23 May 2010. <http://courses.iicm.tugraz.at/ivis/ivis.pdf>.

Appadurai, Arjun. "Archive and Aspiration." Information is Alive. Ed. Joke Brouwer, Arjen Mulder, and Susan Charlton. Rotterdam, NL: V2_Publishing/NAi Publishers, 2003. 14-25. Print.

Archer, Bruce. "The Nature of Research." Co-design, interdisciplinary journal of design (1995): 6-13. Print.

Archined, Stealth, and V2_Lab. "DataCloud." 1998. Web. 12 Feb. 2007. <http://www.stealth.ultd.net/stealth/09_datacloud.html>.

BANFF. "Banff New Media Institute at The Banff Centre, Code Zebra Co-production." 2004. Web. 22 Sept. 2010. <http://www.banffcentre.ca/bnmi/coproduction/2004/code_zebra.asp>.

Bard, Elisabeth. "How to Cross Borders, Social or Otherwise - Art Project Could Be A Security Nightmare - NYTimes.com." 27 Oct. 2004. Web. 20 Oct. 2010. <http://query.nytimes.com/gst/fullpage.html?res=9505EFD7143DF934A15753C1A9629C8B63&pagewanted=all>.

Berners-Lee, Tim, and Mark Fischetti. Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web. New York: HarperBusiness, 2000. Print.

Blast Theory. "Can You See Me Now?." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/58-182-254-223-151-168-147-167-136-51-81-220-216-101-227-170.py>.

Bleeker, Julian, Scott Paterson, and Marina Zurkow. "Mobile Scout: A Field Guide Artist Statement." Ed. Sarah Cook, Steve Dietz, and Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=7&t=2&vt=1&fc=13>.

Blyth, Steven. "My Social Fabric: Your social network explored through a visual language." 2005. Web. 20 Oct. 2010. <bilboquet.es/documentos/Steven_Blyth.pdf>.

Bookchin, Natalie. "Databank of the Everyday Artist Statement." Ed. Sarah Cook, Steve Dietz, and Anthony Kiendl. 1996. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=2&t=2&vt=1&fc=5>.

Borevitz, Brad. "State of the Union." 2007a . Web. 10 June 2010. **<http://stateoftheunion.**onetwothree.net/index.shtml>.

———. "State of the Union: essay." 2007b . Web. 10 June 2010. **<http://stateoftheunion.**onetwothree.net/essay.html>.

Borgatti, Steve. "Introduction to Grounded Theory." Web. 4 Aug. 2010. <http://www.analytictech.com/mb870/introtoGT.htm>.

Borges, Jorge L. "On exactitude in science." Jorge Luis Borges, Collected Fictions. Trans. H. Hurley. London: Penguin Books, 1998. 325. Web. 15 Oct. 2010. <http://www.idb.arch.ethz.ch/files/borges_on_exactitude_in_science_1.pdf>.

Bosma, Josephine. "Constructing Media Spaces: The novelty of net(worked) art was and is all about access and engagement." 2001. Web. 5 June 2010. <http://www.medienkunstnetz.de/themes/public_sphere_s/media_spaces/print/>.

Bourdieu, Pierre. Distinction: A Social Critique of the Judgement of Taste. London: Routledge, 1984. Print.

Brooks, Sawad, and Beth Stryker. "Data Dynamics: Sawad Brooks & Beth Stryker." Ed. Christiane Paul & The Whitney Museum of American Art. 1998. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/datadynamics/brooks.shtml>.

Brouwer, Joke, and Arjen Mulder. "Information is Alive." Information is Alive. Rotterdam, NL: V2_ Publishing/NAi Publishers, 2003. 4-7. Print.

Brouwer, Joke, Arjen Mulder, and Susan Charlton. Information is Alive. Rotterdam, NL: V2_ Publishing/NAi Publishers, 2003. Print.

Brown, Janelle. "Experimental Browser Maps Web's Words." 9 Dec. 1997. Web. 5 June 2010. <http://bak.spc.org/iod/Wired01text.html>.

Brucker-Cohen, Jonah. "PoliceState." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/185-106-216-132-68-224-52-98-238-253-88-39-156-37-27-61.py>.

———. "Rhizome | Art In Your Pocket." 7 July 2009. Web. 9 Oct. 2010. <http://rhizome.org/editorial/2009/jul/7/art-in-your-pocket/>.

Buckhouse, James. "James Buckhouse, Tap 2002." Ed. Christiane Paul & Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/buckhouse.shtml>.

Buckhouse, James, and Holly Brubach. "Tap - 2002 - James Buckhouse in Collaboration with Holly Brubach." 2002. Web. 10 July 2010. <http://awp.diaart.org/buckhouse/>.

Bunting, Heath, and Kayle Brandon. "The Status Project Artist Statement." Ed. Sarah Cook, Steve Dietz, and Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=18&t=2&vt=1&fc=17>.

Burnett, Ron. How Images Think. Cambridge, Mass.: The MIT Press, 2005. Print.

Burnham, Jack. "Systems Esthetics." Artforum Sept. 1968. Web. <http://www.arts.ucsb.edu/faculty/jevbratt/readings/burnham_se.html>.

Byfield, Ted. "Information." Software Studies: A Lexicon. Ed. Matthew Fuller. Cambridge, Mass.: The MIT Press, 2008. 125-132. Print.

C5. "C5: Landscape Initiative." 2001. Web. 25 June 2010. <http://www.c5corp.com/projects/landscape/index.shtml>.

———. "C5: The Analogous Landscape." 2001. Web. 25 June 2010. <http://www.c5corp.com/projects/analogouslandscape/index.shtml>.

———. "C5: The Perfect View." 2003. Web. 25 June 2010. <http://www.c5corp.com/projects/perfectview/index.shtml>.

———. "C5: The Other Path." 2004. Web. 25 May 2010. <http://www.c5corp.com/projects/otherpath/index.shtml>.

———. "C5: The C5 GPS Media Player." 2005. Web. 25 June 2010. <http://www.c5corp.com/projects/gpsmediaplayer/index.shtml>.

———. "C5 Landscape Database API 2.0." 2006. Web. 26 June 2010. <http://www.c5corp.com/research/demtool/index.shtml>.

Cawthon, Nick, and Andrew Vande Moere. "The Effect of Aesthetic on the Usability of Data Visualization." Zurich, Switzerland, 2007. Web. 10 June 2009. <http://web.arch.usyd.edu.au/~andrew/publications/iv07b.pdf>.

Chen, Chun-houh, Wolfgang Härdle, and Antony Unwin, eds. Handbook of Data Visualization. Berlin: Springer, 2008. Print.

Clarke, Roger. "Information Technology and Dataveillance." Commun. ACM 31.5 (1988): 498-512. Print. Web. <http://www.rogerclarke.com/DV/CACM88.html>.

Colosi, Nina. "Jack Toolin: Perfect View ‹ Chelsea Art Museum." 2010. Web. 10 Oct. 2010. <http://www.chelseaartmuseum.org/portfolios/perfect-view-jack-toolin/>.

Cook, Sarah. "An interview with Christiane Paul." 28 Mar. 2001. Web. 10 Oct. 2009. <http://www.crumbweb.org/getInterviewDetail.php?op=3&sublink=&id=10&t=&vt=1&focus=transcript>.

Cook, Sarah, Steve Dietz, and Anthony Kiendl. "Database Imaginary Exhibition." Database Imaginary 2004. Web. 13 Nov. 2008. <http://www.databaseimaginary.org/>.

———. "Memory Theater." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=9&t=2&vt=0&useID=9&fc=12>.

———. "Shelf Life / Drawing Conclusions." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=23&t=2&vt=0&useID=23&fc=14>.

———. "Faculty of Taxonomy." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=14&t=2&vt=0&useID=14&fc=7>.

———. "Things Spoken." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=5&t=2&vt=0&useID=5&fc=20>.

———. "Zapped!." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=24&t=2&vt=0&useID=24&fc=24>.

———. "Encyclopaedia." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=3&t=2&vt=0&useID=3&fc=6>.

Cook, Sarah, Steve Dietz, and Anthony Kiendl. "Mobile Scout: A Field Guide." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=7&t=2&vt=0&useID=7&fc=13>.

———. "Unmovie." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=22&t=2&vt=0&useID=22&fc=22>.

———. "Template Cinema: Short Films About Flying." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=13&t=2&vt=0&useID=13&fc=19>.

———.. "Swipe." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=12&t=2&vt=0&useID=12&fc=18>.

———. "The Status Project." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=18&t=2&vt=1&fc=17>.

———. "How I Learned (1-4)." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=21&t=2&vt=0&useID=21&fc=10>.

———.. "Data Mining the Amazon." 2004: n. pag. Print. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=15&t=2&vt=0&useID=15&fc=4>.

———. "Lungs-London.pl." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=4&t=2&vt=0&useID=4&fc=11>.

———. "Data Diaries." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=1&t=2&vt=0&useID=1&fc=1>.

———. "Agonistics: A Language Game." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=8&t=2&vt=0&useID=8&fc=2>.

———. "Soft Cinema: Mission to Earth." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=11&t=2&vt=0&useID=11&fc=16>.

———. "Slippery Traces." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=6&t=2&vt=0&useID=6&fc=15>.

———. "Databank of the Everyday." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=17&t=2&vt=0&useID=17&fc=8>.

———. "Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 through August 8, 1971." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=19&t=2&vt=0&useID=19&fc=23>.

———. "The File Room." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=17&t=2&vt=0&useID=17&fc=8>.

———. "The Giver of Names." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=16&t=2&vt=0&useID=16&fc=9>.

———. "TreatyCard version 2 (tcv2)." 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=20&t=2&vt=0&useID=20&fc=21>.

———. "Database Imaginary Introduction." Database Imaginary 2005. Web. 30 Apr. 2007. <http://www.crumbweb.org/dbimaginary/introduction.php>.

Colosi, Nina. "Jack Toolin: Perfect View ‹ Chelsea Art Museum." 2010. Web. 10 Oct. 2010. <http://www.chelseaartmuseum.org/portfolios/perfect-view-jack-toolin/>.

Coyne, Richard. Designing information technology in the postmodern age: from method to metaphor. Cambridge, Mass.: The MIT Press, 1995. Print.

Critical Art Ensemble. "Critical Art Ensemble, Mythology of Terrorism on the Net." 1995. Web. 25 Oct. 2010. <http://www.to.or.at/cae/mnterror.htm>.

Cruz, João. "All Streets – data — driven." 2010. Web. 20 Oct. 2010. <http://cruz.at/blog/?p=54>.

Culatti, Valentina. "Zone Interdite, mapping the secret territories - Neural.it :: media culture, hacktivism." 20 Apr. 2006. Web. 30 Oct. 2010. <http://www.neural.it/art/2006/04/zone_interdite_mapping_the_sec.phtml>.

Curral, Allan. "Encyclopaedia Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=3&t=2&vt=1&fc=6>.

Da Costa, Beatriz, Jamie Schulte, and Brooke Singer. "Swipe Project Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=12&t=2&vt=1&fc=18>.

Danis, Catalina M. et al. "Your Place or Mine? Visualization as a Community Component." CHI 2008 Proceedings. Florence, Italy: ACM, 2008. 275-284, 804. Print.

Dartney-Mensah, Lydia. "Qualitative Research." 2000. Web. 15 Aug. 2009. <http://www.socialresearchmethods.net/tutorial/Mensah/default.htm>.

Debatty, Regine. "Do you want to replace the existing normal? - we make money not art." 12 Nov. 2007. Web. 5 June 2010. <http://www.we-make-money-not-art.com/archives/2007/11/do-you-want-to-1.php>.

DeLanda, Manuel. "The Archive Before and After Foucault." Information is Alive. Ed. Joke Brouwer, Arjen Mulder, & Susan Charlton. Rotterdam, NL: V2_Publishing/NAi Publishers, 2003. 8-13. Print.

Deleuze, Gilles, and Félix Guatarri. A Thousand Plateaus: Capitalism and Schizophrenia. 11th ed. Trans. Brian Massumi. Minneapolis: University of Minnesota Press, 1987. Print.

Dholakia, Nikhilesh, Detlev Zwick, and Anil Pandya. "Dataveillance And Panoptic Marketspaces." 2005. Encyclopedia of Database Technologies and Applications. Ed. Laura C. Rivero, Jorge H. Doorn, & Viviana E. Ferragine. Idea Group Reference, 2006. 170-175. Web. <http://www.irma-international.org/viewtitle/11141/>.

Diamond, Sara. "CodeZebra." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/156-211-213-38-138-83-37-149-88-187-170-77-154-105-160-185.py>.

———. "CodeZebra: Promising Interplay." aRt & D Research and Development in Art. Ed. Joke Brouwer et al. Rotterdam, NL: V2_Publishing/NAi Publishers, 2005. Print.

———. "Lenticular Galaxies: The Polyvalent Aesthetics of Data Visualization." Ed. Arthur Kroker & Marilouise Kroker. 1 June 2010. Web. 4 June 2010. <http://www.ctheory.net/printer.aspx?id=651>.

Dick, Bob. "Sources of rigour in action research: addressing the issues of trustworthiness and credibility.." Duxton Hotel, Melbourne, Victoria: Association for Qualitative Research Conference, 1999. Web. 4 June 2010. <http://www.uq.net.au/action_research/arp/rigour3.html>.

———. "Data-driven action research." 2000. Web. 4 June 2010. <http://www.uq.net.au/action_research/arp/datadriv.html>.

———.. "Grounded theory: a thumbnail sketch." 2005. Web. 4 Aug. 2010. <http://www.scu.edu.au/schools/gcm/ar/arp/grounded.html>.

Dietz, Steve. "Interview: Sawad Brooks + Beth Stryker." Dec. 1999. Web. 20 Oct. 2010. <http://www.walkerart.org/archive/7/B57371B81DB88C1A6169.htm>.

———. "Public Sphere_s." 2004. Web. 20 Oct. 2009. <http://www.medienkunstnetz.de/themes/public_sphere_s/public_sphere_s/scroll/>.

———. "C5 and the Path More Or Less Taken." May 2005. Web. 3 June 2011. <http://www.yproductions.com/writing/archives/c5_and_the_path_more_or_less_t.html>.

———. "The C5 Landscape Initiative Installed." 26 May 2005. Web. 25 June 2010. <http://www.yproductions.com/WebWalkAbout/archives/the_c5_landscape_initiative_in.html>.

———. "The Database Imaginary: memory_Archive_Database v 4.0." 1999. Database Aesthetics: Art in the Age of Information Overflow. Ed. Vitoria Vesna. Minneapolis: University of Minnesota Press, 2007. 110-120. Print.

Dodge, Martin. "Show Me The Money: The Map of the Market." 1999. Web. 10 Oct. 2009. <http://www.mundi.net/maps/maps_023/>.

Dragulescu, Alex. "alex dragulescu, spam architecture." 2005. Web. 25 May 2010. <http://sq.ro/spamarchitecture.php>.

———. "alex dragulescu, spam plants." 2006. Web. 25 June 2010. <http://sq.ro/spamplants.php>.

Dunne, Anthony. Design noir: the secret life of electronic objects. Basel: Birkhäuser, 2001. Print.

———. Hertzian tales: Electronic Products, Aesthetic Experience, and Critical Design. 1999. Cambridge, Massachusetts: The MIT Press, 2006. Print.

Dunne, Anthony, and Fiona Raby. "Critical Design FAQ." 2007. Web. 10 Feb. 2010. <http://www.dunneandraby.co.uk/content/bydandr/13/0>.

Dunne, Anthony, Fiona Raby, and Michael Anastassiades. "Do you want to replace the existing normal? 2007/08." 2007. Web. 5 June 2010. <http://www.dunneandraby.co.uk/content/projects/75/0>.

Ehn, Pelle. Work-oriented Design of Computer Artifacts. Stockholm Sweden: Arbetslivscentrum, 1988. Print.

Engelbart, D. C. "Engelbart: Augmenting Human Intellect (1962)." 1962. Web. 25 Oct. 2010. <http://www.invisiblerevolution.net/engelbart/full_62_paper_augm_hum_int.html>.

Fallman, Daniel. "The Interaction Design Research Triangle of Design Practice, Design Studies, and Design Exploration." Massachusetts Institute of Technology Vol. 24.No. 3 (2008): 4-18. Print. <http://daniel.fallman.org/resources/papers/dfallman-di20082434.pdf>.

Fallman, Daniel, and Erik Stolterman. "Establishing criteria of rigour and relevance in interaction design research." Digital Creativity 21.4 (2010): 265-272. Print.

Fauconnier, Sandra. "Personal Records." 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/152-81-101-49-125-128-34-96-201-100-18-215-72-171-220-49.py>.

Flanagan, Mary. "Mary Flanagan, [collection] 2001." Ed. Christiane Paul & Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/flanagan.shtml>.

———. "mary flanagan » works » collection." 2002. Web. 8 Oct. 2010. <http://www.maryflanagan.com/collection>.

Flusser, V. Memories. Ed. T. Druckery. Cambridge, Mass.: The MIT Press, 1999. Print.

Foss, Sonja, and William Waters. Destination dissertation: a traveler's guide to a done dissertation. Lanham: Rowman & Littlefield Publishers, Inc., 2007. Print

Foster, Hal. "The Archive without Museums." The MIT Press October, 77 (1996): 97-119. Print.

Foucault, Michel. Discipline and Punish. 1977. Trans. Alan Sheridan. New York: Vintage Books, 1995. Print.

Frayling, Christopher. "Research in Art and Design." London: Royal College of Art, 1993. 1-5. Print.

Freud, Sigmund. "The Uncanny." Trans. Mark Taylor. 1919. Web. 3 June 2011. <http://www-rohan.sdsu.edu/~amtower/uncanny.html>.

Frieling, Rudolf. "The Archive, the Media, the Map and the Text." 2004. Web. 8 Aug. 2010. <http://www.mediaartnet.org/themes/mapping_and_text/archive_map/1/>.

———. "Mapping and Text Editorial." 2004. Web. 16 Oct. 2010. <http://www.mediaartnet.org/themes/mapping_and_text/editorial/>.

———. "Database and Context: Artistic Strategies within a Dynamic field of Action." aRt & D Research and Development in Art. Ed. Joke Brouwer et al. Rotterdam, NL: V2_Publishing/NAi Publishers, 2005. Print.

Friendly, Michael. "A Brief History of Data Visualization." Handbook of Computational Statistics: Data Visualization. Ed. Chun-houh Chen, Wolfgang Härdle, & Antony Unwin. Berlin: Springer-Verlag, 2006. Print.

———. "A Brief History of Data Visualization." Handbook of Data Visualization. Ed. Chun-houh Chen, Wolfgang Härdle, & Antony Unwin. Berlin: Springer-Verlag, 2008. Print.

Friendly, Michael, and Daniel J. Denis. "Milestones in the History of Thematic Cartography, Statistical Graphics, and Data Visualization." 2001. Web. 22 May 2010. <http://www.datavis.ca/milestones/>.

From Wunderkammer to Meta-Data. "DEAF03 Data Knitting - From Wunderkammer to Meta-Data." 2003. Web. 20 Sept. 2010. <http://www.v2.nl/events/deaf03?searchterm=data+knitting>.

Fry, Ben. "Collected Works." 2008. Web. 1 Dec. 2009. <http://benfry.com/>.

———. "all streets | ben fry." 2008. Web. 6 Oct. 2009. <http://benfry.com/allstreets/>.
———. Visualizing Data. Sebastopol CA.: O'Reilli Media, Inc., 2008. Print.

———. "Learning from Lombardi." 2009. Web. 30 Oct. 2010. <http://benfry.com/exd09/>.

Fujihata, Masaki. "Proposal of Impressing Velocity." 1997. Web. 20 Oct. 2010. <http://www.c3.hu/~masaki/proposal/index.html>.

———. "Field-Works." 2002. Web. 20 Oct. 2010. <http://www.field-works.net/>.

Fuller, Mathew, Colin Green, and Simon Pope. "I/O/D Web Stalker." 1998. Web. 5 June 2010. <http://bak.spc.org/iod/index.html>.

Galloway, Alex. "net.art Year in Review: State of net.art 99." 1999. Web. 8 June 2010. <http://switch.sjsu.edu/web/v5n3/D-1.html>.

———. "Conversions." 2001. Web. 10 Oct. 2009. <http://www.noemalab.org/sections/ideas/ideas_articles/galloway.html>.

———. "Data Diaries Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2003. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=1&t=2&vt=1&fc=1>.

Galloway, Alex, and RSG. "Carnivore." 2001. Web. 12 July 2010. <http://r-s-g.org/carnivore/about.php>.

Garret, Marc. "The Status Project: Data-Mining Our Identities.." 21 July 2010. Web. 25 Oct. 2010. <http://www.furtherfield.org/interviews/status-project-data-mining-our-identities>.

Gates, Carrie. "TreatyCard version 2 (tcv2) Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2003. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=20&t=2&vt=1&fc=21>.

Gere, Charlie. Digital Culture. London: Reaktion Books, 2002. Print.

Gibson, William. Neuromancer. New York: Ace Books. 1984.

Gleich, Michael, and Jeffrey Shaw. "Web of Life." 2002. Web. 20 Sept. 2010. <http://www.web-of-life.de/wolsiteNew/intro/introStart.html>.

Grassmuck, Volker. "Fujihata, Masaki: Impressing Velocity, Media Art Net." 1999. Web. 20 Oct. 2010. <http://www.medienkunstnetz.de/works/impressing-velocity/>.

Greenfield, Adam, and Mark Shepard. Urban Computing and Its Discontents. New York: The Architectural League of New York, 2007. Print. Web. <http://www.situatedtechnologies.net/files/ST1-Urban_Computing.pdf>.

Gusberti, Maia et al. "./logicaland | info." 2002. Web. 20 Oct. 2010. <http://logicaland.net/info.html>.

Haggerty, Kevin D., and Richard V. Ericson. "The surveillant assemblage." British Journal of Sociology 51.4 (2000): 605-622. Print.

Haig, Brian D. "Grounded Theory as Scientific Method." 1995. Web. 4 June 2010. <http://www.ed.uiuc.edu/eps/PES-Yearbook/95_docs/haig.html>.

Halevy, Alon, and Jayant Madhaven. "Surfacing the Deep Web." Ed. Toby Segaran & Jeff Hammerbacher. Sebastopol: O'Reilli Media, Inc., 2009. 133-148. Print.

Hamblyn, Richard, and Martin John Callanan. Data Soliloquies. London: University College London, 2009. Print.

Hansen, M. H., and B. Rubin. "Babble Online: Applying Statistics and Design to Sonify the Internet." Espoo, Finland, 2001. Web. 6 Oct. 2009. <http://www.icad.org/Proceedings/2001/HansenRubin2001.pdf>.

Hansen, Mark, and Ben Rubin. "Listening Post." Cyberarts 2004: International Compendium Prix Ars Electronica. Ed. Gerfried Stocker, Hannes Leopoldseder, & Christine Schopf. Ostfildern DE: Hatje Cantz, 2004. 112-117. Print.

Hart, Hugh. "Decode Exhibition Points Way to Data-Driven Art | Underwire | Wired.com." 25 Jan. 2010. Web. 20 Oct. 2010. <http://www.wired.com/underwire/2010/01/decode-exhibition-points-way-to-data-based-future-art/all/1>.

Harwood, Graham. "Nine(9)." 2003. Web. 9 Oct. 2010. <http://www.mediaartnet.org/works/nine/>.

Harwood, Graham, and Mongrel. "Lungs-London.pl Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=4&t=2&vt=1&fc=11>.

Hayles, N. K. How we became posthuman: virtual bodies in cybernetics, literature, and informatics. Chicago, IL/US: University of Chicago Press, 1999. Print.

Hegedüs, Agnes. "Things Spoken Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 1999. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=5&t=2&vt=1&fc=20>.

Helfert, Heike. "I/O/D: WebStalker, Media Art Net." 2004. Web. 5 June 2010. <http://www.medienkunstnetz.de/works/webstalker/>.

Helguera, Pablo, and Mongrel. "Memory Theater Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=9&t=2&vt=1&fc=12>.

Herrera, Raquel. "IPHONEART. Art in the palm of your hand." 11 Aug. 2009. Web. 20 Oct. 2010. <http://www.thetrendnet.com/oldsite/articulo.php?ida=161>.

Hershman, Lynn. "Synthia." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/217-214-216-57-26-183-99-50-45-55-102-111-114-205-169-58.py>.

———. "Agent Ruby.com." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/83-48-50-173-165-106-255-55-215-206-65-35-203-109-106-144.py>.

Hessels, Scott, and Gabriel Dunne. "Celestial Mechanics." 2005. Web. 30 Oct. 2010. <http://www.cmlab.com/>.

Hobbs, Robert. Mark Lombardi : global networks. New York: Independent Curators International, 2003. Print.

Hoepfl, Marie C. "Choosing Qualitative Research: A Primer for Technology Education Researchers." Ed. Mark Sanders. Journal of Technology Education 9.1 (1997): n. pag. Web. 4 June 2010. <http://scholar.lib.vt.edu/ejournals/JTE/v9n1/hoepfl.html>.

Huhtamo, Erkki. "Trouble at the Interface, or the Identity Crisis of Interactive Art." 2004. Web. 10 Oct. 2010. <193.171.60.44/dspace/bitstream/10002/299/1/Huhtamo.pdf>.

Hutchins, Edwin. Cognition in the Wild. Cambridge, Mass.: MIT Press, 1995. Print.

Jameson, Frederic. The Political Unconscious. Ithaca: Cornell University Press, 1981. Print.

Jeremijenko, Natalie. "LiveWire." 1995. Web. 5 June 2010. <http://www.nyu.edu/projects/xdesign/mainmenu/archive_livewire.html>.

———. "Database Politics and Social Simulations." 1997. Web. 5 June 2010. <http://tech90s.walkerart.org/nj/>.

———. "Delusions of immateriality." 23 Nov. 2000. Web. 5 June 2010. <http://museum.doorsofperception.com/doors6/doors6/transcripts/jeremijenko.html>.

Jevbratt, Lisa. "1:1 Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004b . Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=10&t=2&vt=1&fc=1>.

———. "Out of the Ordinary." 2002. Web. 2 Aug. 2010. <http://jevbratt.com/out_of_the_ordinary/>.

———. "A Prospect of the Sublime in Data Visualizations." 2004a. Web. 13 June 2005. <jevbratt.com/writing/sublime(boulder_version).pdf>.

———. "The Infome - the ontology and expressions of code and protocols.." 2005a. Web. 21 Nov. 2008. <jevbratt.com/writing/crash_jevbratt.pdf>.

———. "Migration description." 2005b. Web. 2 Aug. 2010. <http://128.111.69.4/~jevbratt/1_to_1/3/migration/description.html>.

———. "Rösten Introduktion." 2006. Web. 2 Aug. 2010. <http://128.111.69.4/~jevbratt/the_voice/INTROe.html>.

Kasprzak, Michelle. "Back to the Future - Ars Electronica at 25, Mute magazine." 9 Feb. 2005. Web. 10 Oct. 2010. <http://www.metamute.org/en/Back-to-the-Future-Ars-Electronica-at-25>.

Kaye, Zina, and Mr Snow. "Firmament :: Zina Kaye & Mr Snow." 2001. Web. 25 Oct. 2010. <http://laudanum.net/firmament/>.

Kellehear, Allan. The Unobtrusive Researcher. Sydney, AU: Allen & Unwin Pty LTD, 1993. Print.

Kittler, Friedrich. "Gramophone, Film, Typewriter." Trans. Dorothea Von Mücke & Philippe L. Similon. October 41 (1987): 101-118. Print.

Klanten, Robert et al., eds. Data Flow: Visualising Information in Graphic Design. Berlin: Gestalten Verlag, 2008. Print.

Klima, John. "ECOSYSTM." 2000. Web. 7 Oct. 2009. <http://www.cityarts.com/ecosystm/>.

———. "EARTH." 2002. Web. 6 Oct. 2009. <http://www.cityarts.com/earth/>.

Koblin, Aaron. "Aaron Koblin - Flight Patterns." 2006. Web. 15 Oct. 2010. <http://www.aaronkoblin.com/work/flightpatterns/>.

Koblin, Aaron, and Valdean Klump. "Building Radiohead's House of Cards." Ed. Toby Segaran & Jeff Hammerbacher. Sebastopol: O'Reilli Media, Inc., 2009. 149-166. Print.

Kramer, Gregory. Auditory display : sonification, audification, and auditory interfaces. Reading, Mass.: Addison-Wesley Pub. Co, 1994. Print.

Lamontagne, Valerie. "Data dynamics (exhibition)." 2001. Web. 10 Oct. 2009. <http://www.highbeam.com/doc/1G1-30203240.html>.

Lau, Andrea, and Andrew Vande Moere. "Towards a Model of Information Aesthetics in Information Visualization." Zurich, Switzerland, 2007. 87-92. Web. 10 June 2009. <http://web.arch.usyd.edu.au/~andrew/publications/iv07.pdf>.

Lee, Raymond M. Unobtrusive methods in social research. Buckingam, UK: Open University Press, 2000. Print.

Legrady, George. "Pockets Full of Memories." 2001. Web. 13 Nov. 2008. <http://www.mat.ucsb.edu/g.legrady/glWeb/Projects/pfom/Pfom.html>.

———. "Making Visible the Invisible." 2005. Web. 13 Nov. 2008. <http://www.mat.ucsb.edu/g.legrady/glWeb/Projects/spl/spl.html>.

———. "Cell Tango." 2006. Web. 13 Nov. 2008. <http://www.mat.ucsb.edu/g.legrady/glWeb/Projects/celltango/cell.html>.

———. "CEB Data Visualization." 2009. Web. 13 Nov. 2008. <http://www.mat.ucsb.edu/g.legrady/glWeb/Projects/ceb_/ceb_.html>.

Legrady, George, and Rosemary Comella. "Slippery Traces Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 1995. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=6&t=2&vt=1&fc=15>.

LeMay, Matthew. "Reconsidering Database Form: Input, Structure, Mapping." 2005. Web. 12 June 2009. <http://www.brown.edu/Research/dichtung-digital/2005/2/Lemay/index.htm>.

Levin, Golan. "The Dumpster: Artist Statement." 14 Feb. 2006. Web. 25 June 2010. <http://artport.whitney.org/commissions/thedumpster/statement.html>.

Levin, Golan, Nigan Kamal, and Jonathan Feinberg. "The Dumpster: About the Project." Ed. The Whitney Artport. 2006. Web. 25 May 2010. <http://artport.whitney.org/commissions/thedumpster/about.html>.

Licklider, J. C. R. "Man-Computer Symbiosis." IRE Transactions on Human Factors in Electronics 1 (1960): 4-11. Print. Web. <http://groups.csail.mit.edu/medg/people/psz/Licklider.html>.

Link, David. "Poetry Machine." 2001. Web. 20 Sept. 2010. <http://www.alpha60.de/poetrymachine/poetrymachine.html>.

Link, David. "Poetry Machine_1.5." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/202-43-27-23-129-33-23-224-247-156-249-12-162-196-28-11.py>.

———. "Poetry Machine." aRt & D Research and Development in Art. Ed. Joke Brouwer et al. Rotterdam, NL: V2_Publishing/NAi Publishers, 2005. Print.

Liu, Alan. "Transcendental Data: Toward a Cultural History and Aesthetics of the New Encoded Discourse." Critical Inquiry 31 The University of Chicago (2004): n. pag. Web. 4 Nov. 2008. <http://www.uchicago.edu/research/jnl-crit-inq/features/artsstatements/arts.liu.htm>.

———. Local Transcendence. Chicago, IL/US: University of Chicago Press, 2008. Print.

Lovejoy, Margot. "Margot Lovejoy, Turns 2001." Ed. Christiane Paul & Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/lovejoy.shtml>.

Lovink, Geert. "Nettime Interview with the makers of the Web Stalker browser." 24 Apr. 1998. Web. 8 June 2010. <http://bak.spc.org/iod/nettime.html>.

Lyotard, Jean-François. The Postmodern Condition: A Report on Knowledge. 1979. Trans. Geoff Bennington & Brian Massumi. Manchester: Manchester University Press, 1984. Print.

Manovich, Lev. "The Database as Symbolic Form." 1998. Web. 16 June 2009. <http://manovich.net/DOCS/DATABASE.RTF>.

———. "Cinema by Numbers: ASCII Films by Vuk Cosic." 1999. Web. 20 Oct. 2009. <http://manovich.net/DOCS/cinema_by_numbers.doc>.

———. "Interview with Lev Manovich." 2000. Web. 27 Apr. 2007. <http://switch.sjsu.edu/web/v5n3/J-1.html>.

———. "Metadata, Mon Amour." 2002b. Web. 22 Oct. 2009. <http://manovich.net/DOCS/metadata.doc>.

———. The Language of New Media. Cambridge, Massachusetts: The MIT Press, 2002.

———. "The Anti-Sublime Ideal in Data Art / Data Visualisation as New Abstraction and Anti-Sublime." Aug. 2002c. Web. 22 Oct. 2009. <http://www.manovich.net/DOCS/data_art.doc>.

———. "Metadating" the Image master class." Making Art of Databases. Ed. Joke Brouwer, Arjen Mulder, & Susan Charlot. Rotterdam, NL: V2_Publishing/NAi Publishers, 2003. Print.

———. "Info-Aesthetics Book Proposal." 2004: n. pag. Print.

———. "The Shape of Information." 2005. Web. 20 Oct. 2008. <http://manovich.net/DOCS/IA_Domus_3.doc>.

———. "Social Data Browsing." 12 Feb. 2006. Web. 20 Nov. 2010. <http://www.tate.org.uk/intermediaart/entry15484.shtm>.

———.. "Database as Symbolic Form." 1998. Database Aesthetics: Art in the Age of Information Overflow. Ed. Vitoria Vesna. Minneapolis: University of Minnesota Press, 2007. 39-60. Print.

———. "Software Takes Command." 20 Nov. 2008. Web. 20 Oct. 2010. <http://black2.fri.uni-lj.si/humbug/files/doktorat-vaupotic/zotero/storage/D22GEWS3/manovich_softbook_11_20_2008.pdf>.

———. "Cultural Analytics: Visualing Cultural Patterns in the Era of 'More Media'. Jan. 2009. Web. 22 Nov. 2010. <http://softwarestudies.com/cultural_analytics/Manovich_DOMUS.doc>.

———. "What is Visualization?." 2010. Web. 22 Nov. 2010. <http://manovich.net/blog/wp-content/uploads/2010/10/manovich_visualization_2010.doc>.

———. "Trending: The Promises and the Challenges of Big Social Data." 2011. Web. 30 Apr. 2011. <http://www.manovich.net/DOCS/Manovich_trending_paper.pdf>.

Manovich, Lev, and Jeremy Douglass. "Visualizing Temporal Patterns in Visual Media." 2009. Web. 22 Nov. 2010. <http://softwarestudies.com/cultural_analytics/visualizing_temporal_patterns.pdf>.

Manovich, Lev, Jeremy Douglass, and William Huber. "Understanding scanlation: how to read one million fan-translated manga pages." 2010. Web. 25 Nov. 2010. <http://softwarestudies.com/Understanding_scanlation_2011.pdf>.

Marvin, Carolyn. When Old Technologies Were New: Thinking About Electric Communication in the Late Nineteenth Century. New York: Oxford University Press, 1988. Print.

McCoy, Jennifer, and Kevin McCoy. "How I Learned (1-4) Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2002: n. pag. Print. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=21&t=2&vt=1&fc=10>.

McGarry, Kevin. "Database Imaginary at The Walter Phillips Gallery, Banff Centre
Sarah Cook, Steve Dietz, and Anthony Kiendl interviewed by Kevin McGarry." 12 Jan. 2005. Web. 20 Oct. 2010. <http://www.yproductions.com/writing/archives/database_imaginary_interview.html>.

Migurski, Michal. "Visualizing Urban Data." Ed. Toby Segaran & Jeff Hammerbacher. Sebastopol: O'Reilli Media, Inc., 2009. 167-181. Print.

Migurski, Michal, Tom Carden, and Eric Rodenbeck. "Oakland Crimespotting." 2007. Web. 20 Oct. 2010. <http://oakland.crimespotting.org/#types=AA,Mu,Ro,SA,DP,Na,Al,Pr,Th,VT,Va,Bu,Ar&lat=37.806&zoom=14&lon=-122.270&dtstart=2011-05-18T20:35:28-07:00&dtend=2011-05-25T20:35:28-07:-00&hours=0-23>.

Mills, C. Wright. The Power Elite. New York: Oxford University Press, 1956. Web. 10 Oct. 2009. <http://www.thirdworldtraveler.com/Book_Excerpts/PowerElite.html>.

Mischer, Katarina, and Thomas Traxler. "mischer'traxler the idea of a tree." 2008. Web. 25 June 2010. <http://www.mischertraxler.com/projects_the_idea_of_a_tree_recorder_one.html>.

Mul, Geert. "100,000 Streets." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/97-28-109-33-229-60-106-109-169-186-15-15-185-235-242-4.py>.

Mulder, Arjen, and Joke Brouwer. Information is Alive: Art and Theory on Archiving and Retrieving Data. Rotterdam: NAi Publishers. 2003.

Muntadas, Antoni. "The File Room Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=17&t=2&vt=1&fc=8>.

Myers, Michael D. "Qualitative Research in Information Systems." MISQ Discovery (1997): n. pag. Web. 4 June 2010. <http://www.qual.auckland.ac.nz/>.

Napier, Mark. "Mark Napier, Riot 1999." Ed. Christiane Paul & Whitney Biennial 2002 Net Art Selection. 1999. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/napier.shtml>.

———. "About Point-to-Point." 2001. Web. 10 Oct. 2009. <http://www.potatoland.org/point/about.html>.

———. "Data Dynamics: Mark Napier." Ed. Christiane Paul & The Whitney Museum of American Art. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/datadynamics/napier.shtml>.

———. "Mark Napier, Feed, 2001." 2001. Web. 7 Oct. 2009. <http://www.sfmoma.org/pages/exhibitions/details/espace_napier>.

Nietzsche, Friedrich. The gay science : with a prelude in German rhymes and an appendix of songs. Cambridge UK: Cambridge University Press, 2001. Print.

Nigten, Anne. "DataCloud 2.0 Research: Navigation and Interaction." nd . Web. 5 June 2007. <http://datacloud2.v2.nl/research.html>.

Offenhuber, Dietmar. "(Two Line) Orbital Elements." Ars Electronica 98 Infowar - Information, Power, War / Information, Macht, Krieg. Ed. Gerfried Stocker & Christine Schopf. Vienna, AT: Springer Verlag GmbH, 1998. Web. <http://90.146.8.18/en/archiv_files/19981/E1998b_172.pdf>.

On, Josh, and Futurefarmers. "About | theyrule.net." 2001. Web. 25 Oct. 2010. <http://www.theyrule.net/about>.

———. "They Rule." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/201-45-194-224-217-115-171-228-238-154-141-103-192-249-7-225.py>.

Otto, Susan. "Video as Data: Cross Media Art Practice in the Post Technological Landscape." Media-N: The Online Journal of the New Media Caucus, CADRE Laboratory for New Media, San Jose State University 1.1 (2005): n. pag. Web. 12 Mar. 2007. <http://www.newmediacaucus.org/html/journal/issues/html_only/2005_fall/panels/screenshots/Fall05_Otto.htm>.

Pascual, Anne, and Marcus Hauer. "Schoenerwissen/OfCD | News Archive." 2002b . Web. 25 Oct. 2010. <http://cache.ofcd.com/www.sw.ofcd.com/obj/news.html>.

———. "Minitasking - Visual Gnutella Filesharing." 2002a. Web. 25 Oct. 2010. <http://cache.ofcd.com/www.minitasking.com/>.

Patton, Michael Q. Qualitative Evaluation and Research Methods. Newbury Park, CA: Sage Publications, 1990. Print.

Paul, Christiane. "Benjamin Fry, Valence, 1999." Ed. Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/fry.shtml>.

———. "Data Dynamics." Ed. The Whitney Museum of American Art. 22 Mar. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/past-exhibitions.shtml>.

———. "Whitney Artport: Josh On & Futurefarmers." Ed. Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Sept. 2010. <http://artport.whitney.org/exhibitions/biennial2002/on.shtml>.

———. "John Klima, EARTH 2001." Ed. Whitney Biennial 2002 Net Art Selection. 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/biennial2002/klima.shtml>.

Klima, John. "EARTH." 2002. Web. 6 Oct. 2009. <http://www.cityarts.com/earth/>.

———. "Mapping Transitions: The Topography of Searches, curatorial statement." 2002. Web. 8 June 2010. <http://www.altx.com/mappingtransitions/main.html>.

———. "Whitney Biennial 2002 Net Art Selection." 2002. Web. 10 Aug. 2010. <http://artport.whitney.org/exhibitions/past-exhibitions.shtml>.

———. "C5: The C5 Landscape Initiative, San Francisco Camerawork." 2005. Web. 25 June 2010. <http://www.c5corp.com/venues/camerawork/index.shtml>.

———. "The Database as System and Cultural Form: Anatomies of Cultural Narratives." 1999. Database aesthetics: art in the age of information overflow. Ed. Vitoria Vesna. Minneapolis: University of Minnesota Press, 2007. 95-109. Print.

———. Digital Art. 2003. 2nd ed. London: Thames & Hudson, 2008. Print.

Peljham, Marko. "Solar." Ars Electronica 98 Infowar - Information, Power, War / Information, Macht, Krieg. Ed. Gerfried Stocker & Christine Schopf. Vienna, AT: Springer Verlag GmbH, 1998. Web. <http://90.146.8.18/en/archives/festival_archive/festival_catalogs/festival_artikel.asp?iProjectID=8405>.

Pocock, Philip et al. "Unmovie Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=22&t=2&vt=1&fc=22>.

Polli, Andrea. "Hello, Weather!." 2008. Web. 20 June 2010. <http://www.andreapolli.com/hello_weather/?page_id=88>.

Poster, Mark. The Mode of Information. Chicago, IL/US: The University of Chicago Press, 1990. Print.

Redler, Hannah. "Listening Post - Science Museum Arts Project." 2008. Web. 20 Oct. 2010. <http://www.sciencemuseum.org.uk/visitmuseum/galleries/~/link.aspx?_id=822C31BCD5734CDE94E701ED170F4909&_z=z>.

Richards, Kate. "Ars Electronica: interface futures." RealTime 2003: 24. Print. Web. 20 Sept. 2010. <http://www.realtimearts.net/article/issue58/7299>.

Rinder, Lawrence. "BitStreams." 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/past-exhibitions.shtml>.

Rinehart, Richard. "Information Art: Database & Interface." 2004. Web. 27 Apr. 2007. <http://manray.bampfa.berkeley.edu/~rick/classes/berkeley/fall2004/>.

Rokeby, David. "The Giver of Names Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2000. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=16&t=2&vt=1&fc=9>.

———. "David Rokeby : The Giver of Names." 2002. Web. 20 Oct. 2010. <http://homepage.mac.com/davidrokeby/gon.html>.

Rubin, Ben. "Listening Post — EAR Studio." 2010. Web. 20 Oct. 2010. <http://earstudio.com/2010/09/29/listening-post/>.

Rule, James B. Private Lives and Public Surveillance: Social Control in the Computer Age. New York: Schoken Books, 1974. Print.

Sack, Warren. "Conversation Map: An Interface for Very Large-Scale Conversations." Journal of Management Information Systems 17.3 (2000): n. pag. Print.

———. "Agonistics: A Language Game Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=8&t=2&vt=1&fc=2>.

———. "Aesthetics of Information Visualization." 2006. Web. 19 Nov. 2008. <http://hybrid.ucsc.edu/SocialComputingLab/Publications/wsack-infoaesthetics-illustrated.doc>.

Salavon, Jason. "The Top Grossing Film of All Time, 1 x 1." 2000. Web. 20 June 2010. <http://salavon.com/work/TopGrossingFilmAllTime/>.

———. "Everything, All at Once." 2001. Web. 20 June 2010. <http://salavon.com/work/EAO/image/91/>.

———. "Everything, All at Once (Part III)." 2005. Web. 20 June 2010. <http://salavon.com/work/EAO3/image/257/>.

———. "Portrait (Rembrandt)." 2009. Web. 20 June 2010. <http://salavon.com/work/Portrait/image/167/>.

Sato, Masahiko. "Exhibition "The Definition of Self" Directed by Masahiko Sato." 2010. Web. 20 Oct. 2010. <http://www.2121designsight.jp/en/program/id/about.html>.

Sayer, Andrew. "Long Live Postdisciplinary Studies! Sociology and the curse of disciplinaryparochialism/imperialism." Glasgow, UK, 1999. Web. 20 Feb. 2011. <http://www.lancs.ac.uk/fass/sociology/papers/sayer-long-live-postdisciplinary-studies.pdf>.

Schmidt, Karsten. "PostSpectacular: Social Collider." 2009. Web. 20 Oct. 2010. <http://postspectacular.com/process/20090320_socialcollider>.

Schmidt, Karsten, and Sascha Pohflepp. "Social Collider: ready to collide." 2009. Web. 10 Oct. 2010. <http://socialcollider.net/>.

Schön, Donald. The Reflective Practitioner: How Professionals Think in Action. New York: Basic Books, 1983. Print.

———. "Designing as Reflective Conversation with the Materials of a Design Situation." Research in Engineering Design 3.3 (1992): 131-147. Print.

Selena, Sol. "Introduction to Databases for the Web: Pt. 1." Database Journal 16 Aug. 1998. Web. 18 May 2008. <http://www.databasejournal.com/sqletc/article.php/1428721/Introduction-to-Databases-for-the-Web-Pt-1.htm>.

Shanken, Edward A. "Art in the Information Age: Technology and Conceptual Art." Leonardo 2002: 433-438. Print.

Shaw, Jeffrey, and Peter Weibel. "FUTURE CINEMA Webpage." 2002. Web. 20 Oct. 2010. <http://www.zkm.de/futurecinema/fujihata_werk_e.html>.

Shaw, Jeffrey, and Peter Weibel, eds. Future Cinema: The Cinematic Imaginary After Film. Karlsruhe: ZKM, Center for Art and Media, 2003. Print.

Smeulders, Arnold. "The Sleeping Giant." Rotterdam, NL, 2002. 329-340. Web. <http://www.processpatching.net/downloads/processpatching_download.pdf>.

Smith, Greg J. "Rhizome, Interview with Mitchell Whitelaw." 12 Nov. 2008. Web. 25 June 2010. <http://rhizome.org/editorial/2008/nov/12/interview-with-mitchell-whitelaw/>.

———. "Bismarck & Maus: Perpetual Storytelling Apparatus - Serial Consign." 2010. Web. 10 Oct. 2010. <http://serialconsign.com/2010/06/bismarck-maus-perpetual-storytelling-apparatus>.

Stalbaum, Brett. "Editorial Notes Switch V5n3." 1999. Web. 27 Apr. 2007. <http://switch.sjsu.edu/web/v5n3/L-1.html>.

———. "Database Logic(s) and Landscape Art." 2002. Web. 15 June 2009. <http://www.noemalab.org/sections/ideas/ideas_articles/stalbaum_landscape_art.html>.

———. "An Interpretive Framework for Contemporary Database Practice in the Arts." 2004. Web. 19 Mar. 2007. <http://www.paintersflat.net/database_interpret.html>.

Stalbaum, Brett, ed. "Artists Using Science & Technology: Large DataSets and the Sublime Introduction." YLEM Journal 24.8 (2004): n. pag. Print.

Stocker, Gerfried, and Christine Schopf, eds. Ars Electronica 98 Infowar - Information, Power, War / Information, Macht, Krieg. Vienna, AT: Springer Verlag GmbH, 1998.

Stocker, Gerfried, Hannes Leopoldseder, and Christine Schopf, eds. Cyberarts 2004: International Compendium Prix Ars Electronica. Ostfildern DE: Hatje Cantz, 2004. Print.

Suzuki, Yasuhiro. "Globe-Jungle Project." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/191-31-187-173-131-210-58-215-125-166-181-147-249-112-99-221.py>.

———. "ISEA Article : Globe jungle Project." 2002. Web. 20 Sept. 2010. <http://www.isea-webarchive.org/content.jsp?id=32729>.

Tan, Pang-Ning, Michael Steinbach, and Vipin Kumar. Introduction to Data Mining. San Francisco, CA: Pearson Addison Wesley, 2006. Web. 6 Oct. 2009. <http://www-users.cs.umn.edu/~kumar/dmbook/index.php>.

Teuthorn, Christina. "Information.Macht.Krieg review." Center for Applied Policy Research 19 July 1999. Web. 4 Nov. 2010. <http://www.cap-lmu.de/fgz/reviews/19.php>.

Thaker, Eugene. "Database/Body: Bioinformatics, Biopolitics, and Totally Connected Media Systems." 2000. Web. 27 Apr. 2007. <http://switch.sjsu.edu/web/v5n3/E-1.html>.

Thomas, David R. "A general inductive approach for qualitative data analysis." 2003. Web. 20 Aug. 2010. <http://frankumstein.com/PDF/Psychology/Inductive%20Content%20Analysis.pdf>.

Thomson, Jon, and Alison Craighead. "Template Cinema: Short Films About Flying Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=13&t=2&vt=1&fc=19>.

Thorp, Jer. "Your Device: Your data. How to save your iPhone location data (and help researchers make the world a better place)." 2011. 6/5/2011. <http://blog.blprnt.com/blog/blprnt/your-device-your-data-how-to-save-your-iphone-location-data-and-help-researchers-make-the-world-a-better-place>.

Tonkin, John. "data terra - exhibition/installation." 2002. Web. 20 Oct. 2010. <http://www.dlux.org.au/fs02/exhibition.html>.

Trochim, William M. K. "Research Methods Knowledge Base." 2006. Web. <http://www.socialresearchmethods.net/kb/index.php>.

Tufte, Edward R. Envisioning Information. Chesire, CT: Graphic Press, 1990. Print.

———. Visual Explanations. Chesire, CT: Graphic Press, 1997. Print.

———. Visual and Statistical Thinking: Displays of Evidence for Making Decisions. Chesire, CT: Graphic Press, 1997. Print.

———. The VIsual Display of Quantitative Information. 2nd ed. Chesire, CT: Graphic Press, 2001. Print.

———. Beautiful Evidence. Chesire, CT: Graphic Press, 2006. Print.

Tukey, John W. "The Future of Data Analysis." The Annals of Mathematical Statistics 33.1 (1962): 1-67. Print.

———. Exploratory Data Analysis. Reading: Addison-Wesley Pub. Co, 1977. Print.

———. "We Need Both Exploratory and Confirmatory." The American Statistician 34.1 (1980): pp. 23-25. Print.

University of Openess, Faculty Taxonomy. "Faculty of Taxonomy Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2004. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=14&t=2&vt=1&fc=7>.

Valeski, Jud. "Portable Data in Real Time." Ed. Toby Segaran & Jeff Hammerbacher. Sebastopol: O'Reilli Media, Inc., 2009. 119-132. Print.

Van Nierop, Yvette. "Digital identification." 2002. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/225-146-77-89-69-117-70-125-91-190-159-10-196-78-55-221.py>.

Vande Moere, Andrew. "Form follows Data: the Symbiosis between Design and Information Visualization." Vienna, AT: OKK Verlag, 2005. 31-40. Web. 20 Oct. 2008. <http://web.arch.usyd.edu.au/~andrew/publications/caadfutures05.pdf>.

———. "Worldprocessor - information aesthetics." May 2005. Web. 20 Sept. 2010. <http://infosthetics.com/archives/2005/05/world_processor.html>.

———. "dangling string - information aesthetics." 20 May 2005. Web. 5 June 2010. <http://infosthetics.com/archives/2005/05/dangling_string.html>.

———. "Aesthetic Data Visualization as a Resource for Educating Creative Design." Berlin: Springer-Verlag, 2007. Web. 20 Oct. 2008. <http://web.arch.usyd.edu.au/~andrew/publications/caadfutures07.pdf>.

Varela, Francisco J., Evan Thompson, and Eleanor Rosch. The Embodied Mind: Cognitive science and human experience. Cambridge, Mass.: The MIT Press, 1993. Print.

Versluis, Ari, and Ellie Uyttenbroek. "Exactitudes." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/98-131-91-194-8-177-42-4-25-142-191-138-230-121-160-211.html>.

Vesna, Vitoria. "Database Aesthetics: Of Containers, Chronofiles, Time Capsules, Xanadu, Alexandria and the World Brain." Ed. S. Gill Karamjit, David Smith, & Janet Vaux. AI-Society: The Journal of Human-Centred and Machine Intelligence (2000): n. pag. Web. 10 Mar. 2007. <http://vv.arts.ucla.edu/AI_Society/vesna_essay.html>.

———, **ed.** "Introduction." Database Aesthetics: Art in the Age of Information Overflow. Minneapolis: University of Minnesota Press, 2007. Print.

———. "Database Aesthetics, Jennifer + Kevin McCoy - Soft Rains." 22 June 2008. Web. 10 Nov. 2010. <http://victoriavesna.com/dataesthetics/?p=42>.

———. "Database Aesthetics, Martin Wattenberg - Smart Money's Map of the Market." 2008. Web. 10 Oct. 2009. <http://victoriavesna.com/dataesthetics/?p=24>.

Viegas, Fernanda B., and Martin Wattenberg. "Many Eyes." 2006. Web. <http://www-958.ibm.com/software/data/cognos/manyeyes/>.

Vollard, Piet. "DataCloud." aRt & D Research and Development in Art. Ed. Joke Brouwer et al. Rotterdam, NL: V2_Publishing/NAi Publishers, 2005. Print.

Von Bismarck, Julius, and Benjamin Maus. "Perpetual Storytelling Apparatus." 2009. Web. 10 Oct. 2010. <http://storyteller.allesblinkt.com/>.

Walczak, Marek, and Martin Wattenberg. "Data Dynamics: Wattenberg / Walczak." Ed. Christiane Paul & The Whitney Museum of American Art. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/datadynamics/walczak.shtml>.

Waller, Angie. "Data Mining the Amazon Artist Statement." Ed. Jonah Brucker-Cohen et al. 2003. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=15&t=2&vt=1&fc=4>.

Wallis, Jillian C. "Databases & Data Visualization: the State of the Art." 14 June 2005. Web. 12 Oct. 2010. <www.moebiustrip.org/CENS/DataVisTechRep.doc>.

Ware, Colin. Information Visualization: Perception for Design. 2nd ed. San Francisco, CA: The Morgan Kaufmann Series in Interactive Technologies, 2004. Print.

Watcher, Christophe, and Mathias Judd. "ZONE*INTERDITE » About Zone*Interdite." 2006. Web. 30 Oct. 2010. <http://www.zone-interdite.net/forum/about-zoneinterdite/>.

Wattenberg, Martin. "Martin Wattenberg: Map of the Market." 1998. Web. 10 Oct. 2009. <http://www.bewitched.com/marketmap.html>.

———. "A Net Art Idea Line: Mapping lines of thought through time." Ed. The Whitney Artport. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/commissions/idealine.shtml>.

Watz, Marius. "Generator.x » The data worlds of Alex Dragulescu, pt.1." 28 Aug. 2006. Web. 20 Oct. 2010. <http://www.generatorx.no/20060828/the-data-worlds-of-alex-dragulescu-pt1/>.

Weiser, Herwig. "zgodlocator." Ed. From Wunderkammer to Meta-Data. 2003. Web. 20 Sept. 2010. <http://deaf.v2.nl/deaf/03/150-150-80-250-68-33-73-13-248-98-248-123-89-94-175-71.py>.

Weiser, Mark, and John Seely Brown. "Designing Calm Technology." 21 Dec. 1995. Web. 5 June 2010. <http://nano.xerox.com/weiser/calmtech/calmtech.htm>.

Weskamp, Marcos, and Dan Albritton. "newsmap." 2004. Web. 20 Oct. 2010. <http://marumushi.com/projects/newsmap>.

Weskamp, Marcos, and Dan Albritton. "Newsmap." Cyberarts 2004: International Compendium Prix Ars Electronica. Ed. Gerfried Stocker, Hannes Leopoldseder, & Christine Schopf. Ostfildern DE: Hatje Cantz, 2004. 170-173. Print.

Whitelaw, Mitchell. "Art Against Information: Case Studies in Data Practice." 2007. Print. Web. <http://eleven.fibreculturejournal.org/fcj-067-art-against-information-case-studies-in-data-practice/>.

———. "Weather Bracelet - 3D Printed Data-Jewelry." 7 Oct. 2009. Web. 25 June 2010. <http://teemingvoid.blogspot.com/2009/10/weather-bracelet-3d-printed-data.html>.

Wilhelm, Adalbert. "Linked Views for Visual Exploration." Handbook of Data Visualization. Ed. Chun-houh Chen, Antony Unwin, & Wolfgang Härdle. Berlin: Springer, 2008. 199-215. Print.

Wilson, Stephen. Information Arts: Intersections of Art, Science, and Technology. Cambridge, Mass.: The MIT Press, 2002. Print.

———. Art + Science Now. London, UK: Thames & Hudson, 2010. Print.

Wisniewski, Maciej. "Data Dynamics: Maciej Wisniewski." Ed. Christiane Paul & The Whitney Museum of American Art. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/datadynamics/netomat.shtml>.

Wisniewski, Maciej. "Netomat Art Project." 2007. Web. 10 Oct. 2009. <http://www.netomat.com/art_project.html>.

Wortzel, Adrianne. "Data Dynamics: Adrianne Wortzel." Ed. Christiane Paul & The Whitney Museum of American Art. 2001. Web. 10 Oct. 2009. <http://artport.whitney.org/exhibitions/datadynamics/wortzel.shtml>.

Wright, Richard. "Software Art After Programming." 2004. Web. 10 Aug. 2010. <http://www.virose.pt/vector/b_13/wright.html>.

———. "Data Visualization." Software Studies: A Lexicon. Ed. Matthew Fuller. Cambridge, Mass.: The MIT Press, 2008. 78-87. Print.

Zapped! "Zapped! Artist Statement." Ed. Sarah Cook, Steve Dietz, & Anthony Kiendl. 2005. Web. 13 Nov. 2008. <http://www.crumbweb.org/dbimaginary/getWorkDes.php?id=24&t=2&vt=1&fc=24>.

Ziemkiewicz, Caroline, and Robert Kosara. "The Shaping of Information by Visual Metaphors." IEEE Transactions on Visualization and Computer Graphics 14.6 (2008): 1269-1276. Print. Web. <http://kosara.net/papers/Ziemkiewicz_InfoVis_2008.pdf>.

"acoustic.space.re-lab." 2001. Web. 20 Oct. 2010. <http://acoustic.space.re-lab.net/#background>.

NIST/SEMATECH e-Handbook of Statistical Methods: "Exploratory Data Analysis." 2003. Web. 25 May 2009. <http://www.itl.nist.gov/div898/handbook/index.htm>.

Decode: Digital Design Sensations. London: Victoria and Albert Museum, 2009. Print.

"Longer Bio for Tim Berners-Lee." World Wide Web Consortium. Web. 20 Oct. 2010. <http://www.w3.org/People/Berners-Lee/Longer.html>

Works Cited

Arcangel, Cory. Data Diaries. 2003.

Archined, Stealth and V2_lab. Datacloud. 1998-2002.

Blast Theory, Mixed Reality Lab, and Equator Interdisciplinary Research. Can You See Me Now? 2001.

Bleecker, Julian, Scott Paterson and Marina Zurkow. Mobile Scout: A Field Guide. 2004.

Bookchin, Natalie. Databank of the Everyday. 1996.

Borevitz, Brad. State of the Union. 2007.

Brooks, Sawad, and Beth Stryker. DissemiNET. 1998.

Brucker-Cohen, Jonah, and RSG. PoliceState (Carnivore Client). 2003.

Buckhouse, James, and Holly Brubach. Tap. 2002.

Bunting, Heath, and Kayle Brandon. The Status Project. 2004.

C5. The Analogous Landscape: Rim Of Fire. 2001.

———. The Perfect View. 2003.

———. The Other Path. 2004.

———. The C5 GPS Media Player. 2005.

Curral, Alan. Encyclopaedia. 2000.

Da Costa, Beatriz, Jamie Schulte and Brooke Singer. Swipe. 2002.

Diamond, Sara, and CodeZebra inc. CodeZebra. 2002.

Dragulescu, Alex. Spam Architecture. 2005.

———. Spam Plants. 2006.

Flanagan, Mary. [Collection]. 2002.

Fry, Ben. Valence. 1999-2002.

———. All Streets. 2008.

Fujihata, Masaki. Impressing Velocity. 1992-1994.

———. Field-work@Alsace. 2002.

Fuller, Mathew, Colin Green, and Simon Pope. I/O/D 4: The Web Stalker. 1998.

Galloway, Alex, and RSG. Carnivore. 2001.

Günther, Ingo. Worldprocessor. 1989.

Gusberti, Maia, Michael Aschauer, Nik Thönen and Sepp Deinhofer. ./logicaland. 2002.

Haacke, Hans. Visitors' Profile, Directions 3: Eight Artists, Milwaukee Art Centre, June 19 Through August 8, 1971. 1971.

Hansen, Mark, and Ben Rubin. Listening Post. 2002-2005.

Harwood, Graham. Nine(9). 2003.

———. Lungs: Slave Labour. 2005.

Harwood, Graham, and Mongrel. Lungs-london.pl. 2004.

Hegedus, Agnes. Things Spoken. 1999.

Helguera, Pablo. Memory Theater. 2004.

Hershman, Lynn. Synthia. 2000-2002.

———. Agent Ruby.com. 2002.

Jeremijenko, Natalie. Dangling String / Live Wire. 1995.

Jevbratt, Lisa. Out of the Ordinary (Carnivore Client). 2002.

———. Infome Imager Lite. 2002-2005.

———. Migration. 2002-2005.

———. The Voice. 2006-2009.

Jevbratt, Lisa, and C5. 1:1. 1999-2002.

Kaye, Zina, and Mr Snow. Firmament. 2001-2003.

Klima, John. ecosystm. 2000.

———. EARTH. 2001.

Koblin, Aaron. Flight Patterns. 2006.

Legrady, George. Slippery Traces. 1995.

———. Eternal Summer. 2000.

———. Pocket Full of Memories. 2001, 2003-2007.

———. Making Visible the Invisible. 2005-2014.

———. Cell Tango. 2007.

———. Dataflow. 2008.

Link, David. Poetry Machine_1.5. 2001.

Lombardi, Mark. George W. Bush, Harken Energy, and Jackson Stephens, Ca. 1979-90 (5th Version). 1999.

Lovejoy, Margot. Turns. 2001.

Levin, Golan, Kamal Nigam, and Jonathan Feinberg. The Dumpster. 2006.

Manovich, Lev, And Andreas Kratky. Soft Cinema. 2002.

McCoy, Jennifer, and Kevin McCoy. How I Learned (1-4). 2002.

———. Soft Rains. 2004.

Mischer'Traxler (Katarina Mischer, Thomas Traxler). The Idea of a Tree. 2008.

Mul, Geert. 100.000 Streets. 2002.

Muntadas, Antoni. The File Room. 1994-2010.

Napier, Mark. Riot. 1999.

———. Point-to-Point. 2001.

Offenhuber, Dietmar. (Two Line) Orbital Elements. 1998.

On, Josh, and Futurefarmers. They Rule. 2001.

Peljham, Marko. Solar. 1998.

Poitras, Edward. Shelf Life / Drawing Conclusions. 2004.

Pocock, Philip, Onesandzeros, Gregor Stehle and Axel Heide. Unmovie. 2002.

Polli, Andrea. Hello, Weather! 2008.

Preemptive Media. Zapped! 2005.

Raby, Fiona, Anthony Dune, and Michael Anastassiades. 2007-2008.

Rokeby, David. The Giver of Names. 1990.

Sack, Warren. Conversation Map. 1997-2000.

———. Agonistics: A Language Game. 2004.

Salavon, Jason. The Top Grossing Film of All Time, 1x1. 2000.

———. Everything, All at Once. 2001.

———. Everything, All at Once (Part III). 2005.

———. Portrait (Rembrandt). 2009.

Schoenerwissen (Anne Pascual, Marcus Hauer). Minitasking. 2002.

Schmidt, Karsten, and Sascha Pohflepp. Social Collider. 2009.

Shaw, Jeffrey, Michael Gleich, Bernd Lintermann, and Andreas Kratky. Web of Life. 2002.

Stamen. Oakland Crimespotting. 2007.

Suzuki, Yasuhiro. Globe-jungle Project. 2001.

Thomson, Jon, and Alison Craighead. Template Cinema: Short Films About Flying. 2002.

University of Openess. Faculty of Taxonomy. 2004.

Versluis, Ari, and Ellie Uyttenbroek. Exactitudes. 1994-2004.

Von Bismarck, Julius, and Benjamin Maus. Perpetual Storytelling Apparatus. 2009.

Waller, Angie. Data Mining the Amazon. 2002.

Watcher, Christoph, and Mathias Judd. Zone*Interdite. 2006.

Wattenberg, Martin. Map of the Market. 1998.

———. Artport Idea Line. 2001.

Wattenberg, Martin, and Marek Walczak. Apartment. 2000-2004.

Waynohtêw, Cheryl L'hirondelle. Treatycard Version 2 (Tcv2). 2002-2004.

Weiser, Herwig. Zgodlocator. 1998-2002.

Weskamp, Marcos, and Dan Albritton. Newsmap. 2004.

Whitelaw, Mitchell. The Weather Bracelet. 2009.

Wisniewski, Maciej. netomat™. 1999.

Wortzel, Adrianne. Camouflage Town. 2001.

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